

WILLAMETTE RIVER WATERSHED
TOTAL MAXIMUM DAILY LOAD
IMPLEMENTATION PLAN

Clackamas County,
Clackamas County Service District No. 1
and the City of Happy Valley

Submitted June 8, 2009
Updated January 7, 2011



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SECTION A

OVERVIEW

1. Introduction

The federal Clean Water Act, section 303, requires states to develop water quality standards to support uses beneficial of public water bodies. Where water quality standards are not being met, the water body or the appropriate reach is listed on the 303(d) list of water quality limited water bodies for that parameter. The State of Oregon, through the Oregon Department of Environmental Quality (DEQ), is required to develop Total Maximum Daily Loads (TMDLs) to determine how to meet water quality standards for that parameter.

The TMDL process begins when a stream, lake, or river does not meet water quality standards and is classified as water quality-limited on the state's 303(d) list. TMDLs identify the maximum amount of a specific pollutant that can be present in a water body without violating water quality standards. This is known as the loading capacity. After extensive water quality monitoring and modeling efforts, TMDLs establish the difference between the loading capacity and the current pollutant load. TMDLs are expressed as numeric standards or percent pollutant reductions that need to be met to bring water bodies into compliance with water quality standards. The difference between the current load and the loading capacity is known as excess load (DEQ, 2004). The excess load is split up between the different sources of pollution according to their contribution to the overall pollution load. Any difference between the waterway's loading capacity and the current pollutant load must be mitigated by pollution reduction activities. DEQ develops wasteload allocations for point sources such as wastewater treatment plants and industrial discharges, and load allocations for non-point pollution from agricultural, urban, and forestry lands such as erosion, animal wastes, and stormwater.

The Oregon Administrative Rule (OAR) 340-042-0025 that addresses TMDLs requires local governments and other agencies to develop TMDL Implementation Plans.

Responsible parties that are able to implement pollution reduction strategies are classified as Designated Management Agencies (DMAs). In the Willamette Basin, DMAs include federal agencies such as the Bureau of Land Management, state agencies such as the Oregon Department of Forestry and the Oregon Department of Agriculture, counties, cities, and others. According to OAR 340-042-0025, TMDL Implementation Plans must include the following five elements:

1. Management strategies that will be used to achieve load allocations
2. A timeline and schedule to achieve measurable milestones
3. A plan for periodic review and revision of the implementation plan
4. Evidence of compliance with applicable statewide land use requirements
5. Any other analyses or information as specified in the Water Quality Management Plan

The DEQ finalized the Willamette River TMDL document in September 21, 2006, and was approved by the U.S. Environmental Protection Agency (EPA) on September 29, 2006. A portion of the Willamette River watershed lies within Clackamas County, and certain County Service Districts, the City of Happy Valley, and many other local governmental entities.

This TMDL Implementation Plan is for Clackamas County, Clackamas County Service District No. 1 (CCSD #1), and the City of Happy Valley and summarizes the management strategies for protecting and improving water quality. The particular focus of this Implementation Plan is on strategies for reducing TMDL pollutants from non-point sources to achieve load allocations. Strategies for reducing TMDL pollutants from point sources to achieve waste load allocations are addressed comprehensively in point source permits for storm water and wastewater discharges.

To comply with DEQ requirements for TMDL Implementation Plans (provided in OAR 340-042-0080(3)), the management strategies and information provided herein address each parameter within the Willamette River TMDL over which Clackamas County, CCSD #1, and the City of Happy Valley have jurisdiction (in stream heat, *E. coli*, dichlorodiphenyltrichloroethane [DDT], and mercury). In addition, we believe that this Implementation Plan demonstrates commitment and reasonable assurance of implementation and maintenance of effort over time. Many of the elements of this TMDL Implementation Plan are also summarized in the Matrices of Management Strategies in Chapters 8 through 12.

2. Clackamas County Surface Water Overview

2.1 Watersheds

The major watersheds of Clackamas County are shown on Figure 1. A large portion of Clackamas County is drained by the Willamette River and its tributaries including the Clackamas, Molalla, Pudding, and Tualatin Rivers (Table 1). The remaining lands are drained by the Sandy River, which enters the Columbia River in the City of Troutdale. A separate TMDL Implementation Plan outlines Clackamas County’s and CCSD #1’s efforts to comply with the Sandy River’s TMDLs.

Clackamas County watersheds	Total acres in watershed	Watershed in Clackamas County, acres	Percent of watershed in Clackamas County
Clackamas	602,634	540,456	90
Molalla-Pudding	560,037	305,785	55
Tualatin	453,849	12,587	3
Lower Columbia-Sandy	560,566	235,361	42
Middle Willamette	455,502	73,906	16
Lower Willamette	411,905	33,797	8
<i>Total</i>	<i>3,044,494</i>	<i>1,201,890</i>	
<i>Sub-watershed of Lower Willamette</i>			
Johnson Creek	32,709	9,902	30

This TMDL Implementation Plan specifically addresses the Willamette TMDL’s wasteload, load, and interim allocations, but not in the portions of the Willamette River’s watershed in Clackamas County which are drained by the Tualatin, Molalla, and Pudding Rivers.

- *Tualatin River:* Certain private and publicly owned lands in Clackamas County which are drained by the Tualatin River (not including lands in the cities of West Linn, Tualatin, and Lake Oswego) are addressed by a separate TMDL Implementation Plan that was written specifically for the Surface Water Management Agency of Clackamas County (SWMACC), Clackamas County, and the City of Rivergrove on August 7, 2003. This Implementation Plan was revised in January 2011. .
- *Molalla-Pudding Rivers:* Certain private and publicly owned lands in Clackamas County which are drained by the Molalla and Pudding Rivers (not including lands in the cities of Molalla, Canby, and Barlow) are not addressed by any TMDL implementation Plan at this time, for the Molalla-Pudding subbasin’s TMDLs are under development and are not expected to be finalized until late 2008. Clackamas County expects to submit an implementation plan in 2011..

2.2 Organizational Summary

Clackamas County, including the Department of Transportation and Development (DTD), Water Environment Services (WES), and Business & Community Services (BCS – see below), as well as CCSD #1 and the City of Happy Valley are all playing a role in implementing portions of this Implementation Plan. General responsibilities of each County Department, County Service District, and the City of Happy Valley are outlined in Table 2.

DMA name	Jurisdictional area	TMDL Implementation Plan responsibility
Clackamas County WES	Limited to CCSD #1 and TCSD (except for septic system and 1200C programs, which are county-wide)	Administers CCSD #1 and TCSD. Also administers septic system and 1200C programs on a county-wide basis
Clackamas County DTD	County-wide	Includes Planning, Roads & Engineering and the Office of Sustainability. Riparian area use and other land uses(including development activities), roads, and all-purpose stormwater management agency; illegal dumping and solid waste nuisances on private property
Clackamas County BCS	County-wide	Clackamas County Parks, North Clackamas Parks & Recreation District, Economic Development, County Fair, management of surplus real estate, and Dump Stoppers (an illegal solid waste dumping prevention program)
CCSD #1	In-district	All-purpose stormwater management agency, and riparian area land use ¹
City of Happy Valley	To City limits only	Roads, erosion control permitting, tree ordinance, and land use. Most other stormwater management functions are provided by WES CCSD #1 on behalf of the City ¹

¹ Includes, but is not limited to, public education/involvement, illicit discharge elimination, erosion control, development review of sanitary and storm sewer systems and storm sewer system maintenance programs.

WES administers CCSD #1 and the Tri-City Service District (TCSD). TCSD and CCSD #1 provide many services to the community, including sanitary wastewater collection and treatment. CCSD #1 provides stormwater management services.

2.3 Surface Water Responsibilities

As stated above, Clackamas County, CCSD #1, and the City of Happy Valley have responsibility as DMAs and have cooperated in the development of this Implementation Plan. Each organization has ongoing programs that provide for overall management of surface water, and water quality that contribute to watershed health in the Willamette watershed.

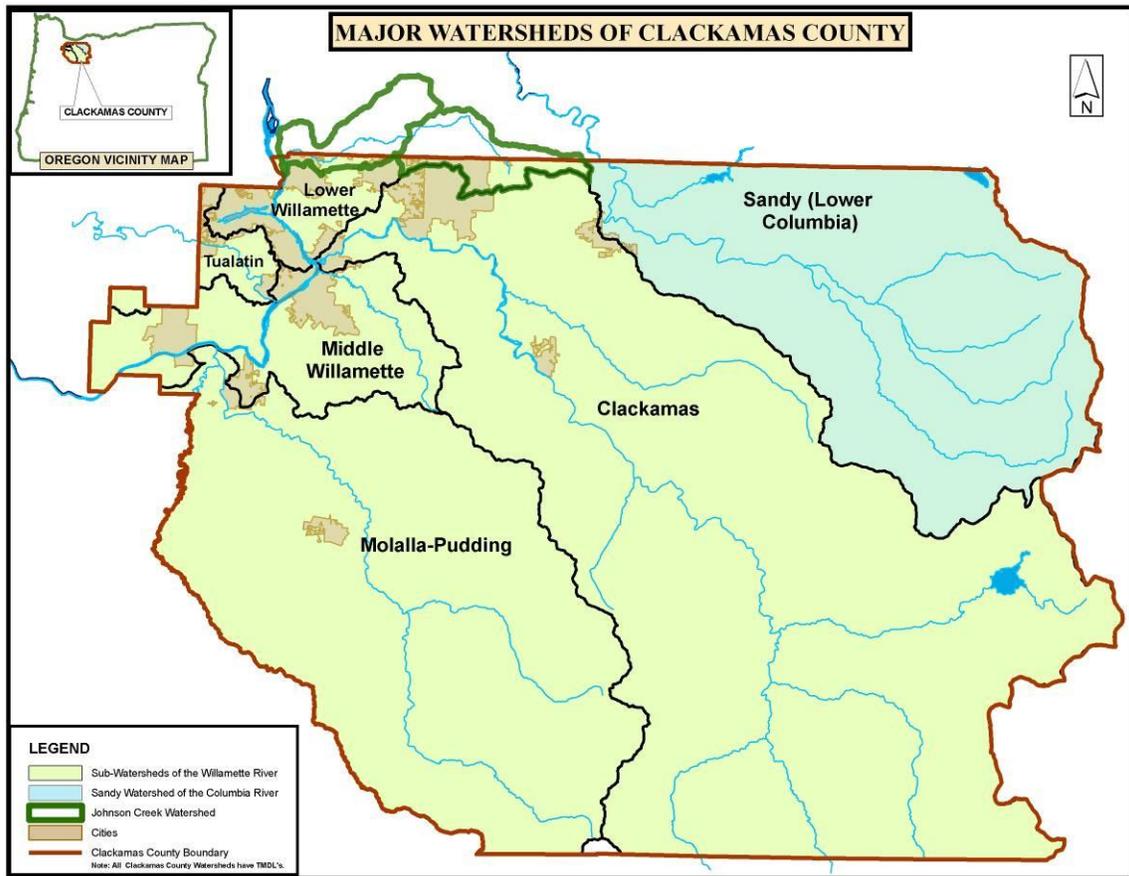
2.3.1 Wastewater

Discharges of treated wastewater effluent occur at several locations throughout the Willamette watershed. WES administers CCSD #1, which owns the Boring Wastewater Treatment Facility (WWTF) and the Kellogg Creek Water Pollution Control Plant (WPCP), and administers the TCSD, which owns the Tri-City WPCP. Figures A-2 and A-3 show the locations of these facilities. The TCSD and CCSD #1 provide many services to the community, including sanitary wastewater collection and treatment. The three wastewater treatment facilities are operated and maintained by WES employees.

2.3.2 Stormwater

Stormwater enters the Willamette River and tributaries in the Willamette TMDL's geographic area from areas regulated by the NPDES Municipal Separate Stormwater System (MS4) program as well as from areas that are not regulated under the NPDES MS4 program. Figures 2 and 3 illustrate the NPDES MS4 permit area in Clackamas County. DEQ considers these NPDES MS4-permitted storm sewer outfalls as point sources and as a result they are not addressed in this Implementation Plan. The NPDES MS4 permit was issued to the City of Happy Valley, Clackamas County, and CCSD #1 and other co-permittees in December 1995. It was subsequently renewed in March 2004, and modified in July 2005, and December 2007.

Figure 1. Major Watersheds of Clackamas County



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3. TMDL Parameters and Allocations

TMDLs have been developed in the Willamette watershed for *E. coli*, DDT/dieldrin (Johnson Creek only), mercury, and in-stream water temperature. Table 3 summarizes each TMDL parameter, load allocation, measurement, and DMA.

3.1 *E. coli*

The Load Allocations (LAs) in the Willamette TMDL specify that a 78 percent reduction in in-stream *E. coli* loads is needed in all streams and tributaries in the portion of the Lower Willamette Subbasin that is in Clackamas County, including the Clackamas River watershed. The only exceptions are Bargfield and Delano Creeks in the Clackamas River watershed where the LAs call for 83 percent and 89 percent reductions, respectively.

Affected waters in CC's part of Willamette River watershed	Parameters	Measurement method	Allocation type (and NPDES permit type)	LA	DMA
All ¹	In-stream temperature	Surrogate: shade	LA	Attaining "system potential vegetation" conditions	CC, CCSD #1, Happy Valley
Mainstem Willamette River (RM 50 to RM 0)	Cold water refugia	Restoration of refugia	None	Restore where feasible	CC
All ¹	<i>E. coli</i>	Direct	LA	78 percent reduction (83 percent and 89 percent in Bargfield and Delano)	CC, CCSD #1, Happy Valley
Johnson Creek	DDT/ dieldrin	Surrogate: TSS	LA	94 percent reduction in DDT (<15 mg/L TSS)	CC, CCSD #1, Happy Valley
All ²	Mercury	Direct	Interim	27 percent reduction from all sources	Soil disturbance, air deposition, etc. ³

¹ Does not include the Tualatin, Molalla and Pudding Rivers

² Does not include the Molalla and Pudding Rivers

³ Assigned to broad categories of discharges, not to individual cities or counties

3.2 DDT and Dieldrin

The DDT and dieldrin TMDL is specific to Johnson Creek watershed which drains a small portion of Clackamas County near the cities of Milwaukie, Happy Valley, and Damascus. Less than 1,000 acres (less than 3 percent) out of a total watershed area of about 55 square miles of the entire Johnson Creek watershed is within CCSD #1 and/or the City of Happy Valley. Additional acreage in Clackamas County's portion of the watershed lies within the City of Damascus and in the rural area upstream from Damascus.

The TMDL has assigned a LA for all non-point sources in the watershed of a 94 percent reduction over time from current DDT levels. DEQ has assumed that reducing DDT levels will also yield sufficient reductions in the level of dieldrin (and breakdown products) within Johnson Creek.

Dieldrin and DDT, when they are present in stormwater or creek water, may be attached to or associated with small, suspended solid particles. As part of the Willamette TMDL development, DEQ has established reduction of total suspended solids (TSS) as a measurement of overall DDT reduction. The TMDL's TSS target is 15 milligrams per liter (mg/L) for non-point sources, thus if stormwater runoff by this Implementa-

tion Plan contain 15 mg/L or less TSS it is assumed that the level of DDT has been reduced by 94 percent or more. Complying with the DDT LA constitutes compliance with the dieldrin TMDL as well.

3.3 Mercury

The TMDL has established a 27 percent reduction over time from all sources (point and non-point sources) of mercury compared to current loading levels.

Although the water quality criteria for mercury in the Willamette River's water column is currently being met at all times or nearly all times, excessive levels of mercury have accumulated in certain species of the watershed's fish.

The stated objective of the mercury TMDL is to reduce average fish tissue mercury concentrations in the Willamette River so that all fish species are safe for human consumption. The multiple fish consumption advisories for mercury in the Willamette Basin and the numerous 303(d) listings indicate that this beneficial use is not currently being met. DEQ acknowledges that it may take many years, perhaps even decades, to ultimately achieve the desired reduction in fish tissue concentrations of mercury. In establishing interim water quality guidance values, DEQ considered the criteria and thresholds utilized when fish consumption advisories are issued.

3.4 Temperature

Numerous stream and river reaches in Clackamas County are part of the Willamette temperature TMDL including: the Willamette and Clackamas Rivers and Johnson and Cow Creeks. DEQ has established Percent Effective Shade (PES), a measurement of the shade-yielding capacity of a riparian area, is the TMDL's surrogate for in stream heat load. "System potential vegetation" conditions represent areas with a high PES value. "System potential vegetation" conditions are considered by DEQ to be necessary to achieve "system potential effective shade," which is defined by DEQ as "the potential near-stream vegetation that can grow and reproduce on a site, given the climate, elevation, soil properties, plant biology, and hydrologic processes." Shade curves, developed by DEQ for the Willamette basin based on potential vegetation growth under different soil conditions, display the shade coverage that could potentially be present at given locations.

3.5 Cold Water Refugia (CWR)

As a requirement of the Willamette River TMDL, DMAs located along the mainstem Willamette River from river mile 50 downstream to the confluence with the Columbia River need to address CWR within their TMDL Implementation Plans. This reach of the river has been designated as a migration corridor for salmonids. CWR are needed along this reach to offer migrating salmonids relief from the warmer river temperatures found in the summer months. Plans shall look at identifying existing CWR and provide options for protecting or enhancing such areas. Wherever localized CWR have been altered through channel modification or by other means, consideration should be given to exploring options for restoring or enhancing these areas of CWR where feasible.

4. Goals and Objectives of Plan

The goal of this Implementation Plan is to identify the ongoing and planned management strategies to improve watershed health and address requirements of the Willamette River TMDL related to reductions in bacteria (*E. coli*), DDT, dieldrin, in-stream heat, and mercury loading.

The objectives of this Implementation Plan include applying adequate management strategies for pollution prevention (e.g., erosion control, riparian protection strategies, and stormwater management strategies), evaluating strategies annually for effectiveness and level of service, and implementing adaptive management as necessary.

To achieve this goal and these objectives, this Implementation Plan's DMAs (Clackamas County, CCSD #1, and the City of Happy Valley) will be implementing the portions of this Plan that they are responsible for in a coordinated fashion. A single annual report to DEQ is expected to be submitted by these DMAs each year.

In order to focus the efforts toward developing a more integrated and coordinated approach to improving the health of the watersheds in Clackamas County amongst the Clackamas County departments, a TMDL Implementation Coordinating committee has recently been formed that consists of WES, DTD Roads, DTD Engineering, DTD Planning, and Parks. This committee will meet monthly in order to finalize coordination efforts and has identified and committed to the following goals and objectives:

1. WES will provide both technical expertise and the identification of high-priority maintenance areas within the CCSD#1 boundary to DTD through its Watershed Action Planning process. This will help DTD to develop a cost-effective program of enhanced and targeted maintenance.
2. WES will perform BMP effectiveness monitoring of these enhanced maintenance activities
3. DTD and WES will work together ensure that the County's Integrated Pest Management Program is in-step with the County's watershed health goals
4. County DTD - adopted WES' stormwater quality and quantity design standards in 2009 for those areas within the unincorporated county
5. All County department representatives agreed on the need to be more responsive to reporting requirements.
6. Begin the process for identifying interested parties, possible site-locations; design requirements; and possible funding sources for a shared decant facility

These objectives will be revised and additional tasks will be added as the committee's and the DMA's implementation work progresses.

In addition, DTD hired new *Environmental Policy Specialist* staff position to address environmental issues and integrate them into existing programs/processes in 2009.

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SECTION B

POLLUTANT REDUCTION AND MANAGEMENT STRATEGIES

5. Potential Sources of Pollutants

According to the Oregon Department of Environmental Quality (DEQ) specific known or suspected sources of TMDL parameters should be noted in this Implementation Plan. The potential sources of TMDL parameters in the Clackamas County watersheds are discussed below.

5.1 *E. coli*

E. coli bacteria can enter surface water bodies from many sources, including the feces of wild mammals, tame and wild waterfowl, wild songbirds, pets, and livestock, and from improperly functioning (i.e., failed) septic systems.

Studies conducted in the Puyallup River watershed in Washington state and the Tualatin River watershed in Oregon indicate that stormwater washing over fecal matter that had been deposited by a range of wild animals, including birds and rodents, appears to be the source of most *E. coli* contamination in urban stormwater.

In rural areas where no sanitary sewer infrastructure exists, on-site septic systems can be a significant source of *E. coli* bacteria given the right circumstances. WES on behalf of Clackamas County Service District Number 1 (CCSD#1) is in the process of providing sanitary sewer services to one of the last un-sewered areas within the UGB in Clackamas County. The North Clackamas Revitalization Area (NCRA) is the last densely populated area in Oregon to be served by systems better suited to less populated rural areas. Due to the well-drained soil types in much of the area, these systems – particularly cesspools which inject waste into the ground – present a danger to the water quality of Johnson Creek. Johnson Creek is included on the ODEQ 303(d) list due to high levels of *E. coli* bacteria and is a tributary to the Willamette River. Other potential sources of *E. coli* bacteria in rural areas include:

- Livestock waste
- Wild bird and mammal feces
- Pet waste
- Illegal dumping of solid waste
- Dead animals
- Spills and illicit discharges
- Stormwater runoff

5.2 DDT and Dieldrin

DDT and dieldrin are organochlorine insecticides that have been banned for at least 20 years. Historically, DDT and dieldrin were both used extensively. Examples of typical usage included killing mosquitoes in urban areas and killing insects in farmed lands. Both compounds are long-lived in soils and can be toxic to

animals. They are also highly hydrophobic, which means they tend to bind to soil particles and the fatty tissues of animals and do not readily dissolve in water. Due to the extensive past use and the long-lived nature of these compounds, these materials are ubiquitous in the environment and have been detected in virtually all media (i.e., water, soil, and animal tissue).

The use of dieldrin in the United States was restricted in 1970 and all uses of products containing dieldrin were banned in 1983. In addition to being an insecticide, dieldrin is also a long-lived oxidation breakdown product of aldrin, another organochlorine pesticide. Aldrin is known to quickly break down—typically within a matter of days—into dieldrin in an animal’s body or in the environment. Thus, the concentration of dieldrin in the environment is often a cumulative result of the historic use of both aldrin and dieldrin. Dieldrin is very stable in the environment and, unfortunately, does not easily break down into harmless by-products. Since dieldrin and aldrin are no longer being used, the transport of dieldrin to surface water bodies is believed to be due, in large part, to stormwater runoff. It is believed that dieldrin is also able to be dispersed in the environment by wind and volatilization as well. In upland areas, these molecules preferentially bind to soil.

DDT was banned from use in the United States in 1972. Over time, DDT breaks down to form the metabolites DDE and DDD, which are also associated with toxicological effects in animals. Transport of these molecules (DDD, DDT, and DDE) to surface water bodies is believed to be due, in part, to stormwater runoff. They can also be dispersed in the environment by wind and volatilization. In upland areas, these molecules preferentially bind to soil. In water, they tend to bind to sediment, volatilize, photodegrade, or be taken up into the food chain.

Several recent studies have been conducted in the Johnson Creek watershed by the USGS and by the Inter-jurisdictional Committee (IJC) for Johnson Creek; WES is an IJC member. Through these studies, it has been determined that:

- The bulk of the loading of DDT (and breakdown products) and dieldrin was already in the creek at the point where it entered Gresham’s city limits. The watershed above this point is rural, dominated by agricultural and rural residential land uses. Much of the time, the concentration of these insecticides in the creek’s water is actually diluted as it flows through the urban portion of the watershed.
- DDT (and breakdown products) can be discharged into Johnson Creek from publicly owned storm sewer systems in the urban area, although in many instances, DDT is present at such low levels that in-stream water quality standards aren’t exceeded.
- Dieldrin can be discharged into Johnson Creek from publicly owned storm sewer systems in the urban area, although in nearly all instances, dieldrin is either undetectable or is only present at low levels that do not exceed the in-stream water quality standard.

At this time, Clackamas County, WES, CCSD #1, and the City of Happy Valley are not aware of any specific known sources of DDT and dieldrin in the Johnson Creek watershed, although suspected or general (i.e., non-specific) sources include:

- Stormwater runoff from agricultural, forest, and urban lands
- Soil erosion from new development and redevelopment
- Soil disturbance related to road maintenance
- Illegal dumping of solid waste

- Spills and illicit discharges

5.3 Mercury

Mercury is a naturally occurring element found in high concentrations in cinnabar deposits. In Oregon, mercury was mined commercially and used extensively in gold and silver amalgamation (Brooks, 1971; Park and Curtis, 1997). Mercury is present in other rock types and soil types in Clackamas County, given the role that volcanoes have played in our geologic history. Mercury is also naturally present in geothermal areas and in many types of native vegetation; significant amounts can be released into the atmosphere during wild/forest fires.

Mercury has been used historically in fungicide formulations and can still be found in many commercial products, including fluorescent lights, thermometers, automobile switches and dental amalgam. Illegal dumping of solid waste containing mercury can also be a source.

Mercury is in fossil fuels such as coal, natural gas, diesel fuel, and heating oil. The mercury present in these fuel sources is often released into the atmosphere upon combustion. Atmospheric mercury can be transported great distances and is known to be deposited on the landscape via either wet or dry deposition (Sweet et al., 1999, 2003). Research has shown that much of the mercury which enters the Willamette River had been deposited in the watershed by the atmosphere.

Mercury can be present in various physical and chemical forms in the environment (Ullrich et al., 2001; USEPA, 2001b). The majority of the mercury found in the environment is in the form of inorganic or elemental mercury, but these forms of mercury can be converted to organic or methyl mercury by sulfate reducing bacteria. Methyl mercury production is affected by a host of physical and chemical factors including temperature, redox potential, dissolved oxygen levels, organic carbon, sediment particle size, alkalinity, sulfate concentration, and pH. Methyl mercury, once formed, represents the most bioaccumulative form of mercury in fish tissue and the most toxic form of mercury for human consumers (USEPA, 2001a). The primary route of human exposure to mercury is via the consumption of freshwater fish, saltwater fish, and other seafood containing mercury (USEPA, 2001a).

Mercury can enter surface water bodies in many ways. One way that mercury can be transported to surface waters is through stormwater runoff. Some of the mercury in stormwater runoff may be washed from impervious surfaces after having been deposited on the surface from the atmosphere. Stormwater runoff can also carry mercury if it erodes mercury-containing soils.

At this time, Clackamas County, CCSD #1, and the City of Happy Valley are not aware of any specific known sources of mercury, although suspected or general (i.e. non-specific) sources include:

- Erosion of soils from agricultural, forest, urban and commercial/industrial areas and lands
- Runoff and soil erosion from new development and redevelopment and commercial and industrial areas
- Soil disturbance related to road maintenance
- Illegal dumping of solid waste
- Spills and illicit discharges of certain materials

5.4 Temperature

Stream temperature is determined by many factors. Heat energy is transferred to and from streams by the following processes:

- Short-wave radiation (primarily direct solar radiation, also known as radiant heat)
- Long-wave radiation (thermal radiation emitted from the Earth's surface)
- Convective mixing with the air
- Evaporation
- Conduction with the stream bed
- Advective mixing with inflow from groundwater and tributary streams
- Advective mixing with point source inputs such as wastewater effluent

There are varying scientific opinions about the relative importance of the above listed processes as a source for temperature increases in streams. While it is known that all of the above processes interact to produce the temperature regimes observed in streams and rivers and it is also known that the relative importance of each process differs among locations, there is disagreement as to what are the dominant processes.

Some scientific literature indicates that in small- to intermediate-sized streams of forested regions, incoming solar radiation represents the dominant form of energy input to streams during summer. Groundwater inputs may be important in small streams where they constitute a large percentage of the overall discharge, particularly during periods of the year when flows are low. As streams become larger and wider, riparian vegetation shades a progressively smaller proportion of the water surface, diminishing the effects of riparian shading and advective mixing on water temperature and increasing the importance of evaporative heat-loss.

Other recent scientific literature considers air temperature over the stream to be the most influential factor in stream temperature. Alteration of the riparian canopy, even well back from the stream, can open air flow and change the microclimate over the stream. Increasing airflow, particularly in areas with high summer air temperatures, can increase heat exchange with the stream and thereby elevate water temperatures. Thus, even where direct shade is retained over streams, alteration of riparian stands and adjacent upland areas may result in increased stream warming due to changes in the microclimate over the stream.

Riparian vegetation modifies convective and evaporative heat-exchange losses by creating a microclimate of relatively high humidity, moderate temperatures, and low wind speed compared with surrounding uplands. These microclimate conditions tend to reduce both convective and evaporative energy exchange by minimizing temperature and vapor-pressure gradients.

Potential or actual types of non-point source in-stream heat loading include:

- Alteration of the riparian and upland canopy; and removal of streambank vegetation
- Filling and drying of wetlands
- Interception and rerouting of groundwater inputs
- Withdrawal and return of water for agricultural irrigation
- Release of water from ponds and reservoirs
- Changes in channel or water body size
- Suspended sediment/turbidity in streams
- Low stream flow

Although scientific studies indicate that water temperature is affected by a variety of processes, DEQ's analysis of temperature sources in the TMDL contains a simplified assessment of non-point temperature sources. The TMDL states that elevated summertime stream temperatures attributed to non-point sources result from increased solar radiation heat loading. The TMDL attributes non-point source temperature increases to the disturbance/removal of near stream vegetation that has reduced levels of stream shading and exposed streams to higher levels of solar radiation (i.e., reduction in stream surface shading via decreased riparian vegetation height, width, and/or density increases the amount of solar radiation reaching the stream surface). As a result, management strategies to address elevated water temperature in this Implementation Plan are focused on increasing the percent effective shade in the watershed and other reasonable steps to reduce elevated stream temperatures.

5.5 Cold Water Refugia (CWR)

CWR are areas within rivers and creeks that maintain cooler temperatures in summer when water temperature elsewhere in the river increases. CWR offer migrating salmonids and other native fish and aquatic species relief from the warmer river temperatures. Alteration to river channel and riparian structure including removal or lack of large woody debris and modifications to deep pools and overhanging bank areas can reduce the presence of CWR. Reductions in stormwater infiltration and groundwater inputs and increasing temperatures of tributary stream inputs can also reduce the presence of CWR.

6. TMDL Implementation Responsibilities

Responsibility for implementing the TMDLs has been distributed among a variety of designated management agencies (DMAs). For the area of Clackamas County's and the City of Happy Valley's jurisdiction, these DMAs include:

- WES
 - Clackamas County Service District #1 (CCSD#1)
 - Tri-City Service District),
- Clackamas County
 - Department of Transportation & Development
 - Planning
 - Roads & Engineering
 - Office of Sustainability
 - Business & Community Services
 - Clackamas County Parks
 - North Clackamas Parks & Recreation District
 - Community Environment
 - Economic Development
 - County Fair
- City of Happy Valley

TMDLs are being implemented by appropriate state and federal agencies for state and federally-owned and managed lands. TMDLs for private lands in timber management areas are being implemented through the Oregon Department of Forestry (ODF), and the TMDLs for private lands in agricultural areas are being implemented through the Oregon Department of Agriculture (ODA). TMDLs are being implemented through the NPDES permitting process for point sources of pollutants such as wastewater treatment plant discharges and NPDES MS4-permitted stormwater discharges.

This Implementation Plan focuses on management strategies that address non-point sources of pollution in Clackamas County and the City of Happy Valley, including surface discharges of stormwater runoff from areas that are not regulated by the NPDES MS4 program. Stormwater runoff directed to subsurface discharge through injection systems and infiltration systems is not addressed through this Implementation Plan. Privately owned storm sewer outfalls in the Oak Lodge Sanitary District (OLSD) are not addressed in this Implementation Plan; please see OLSD's Willamette TMDL Implementation Plan for more information. Lands subject to ODF and ODA jurisdiction are also not the focus of this Implementation Plan. In addition, this Implementation Plan does not address runoff from lands owned by the state or federal government. See Chapters 1 and 2 for previous discussion on jurisdictional authority and responsibility coverage.

This Implementation Plan addresses TMDL parameters that are discharged by these types of stormwater drainage systems:

- Clackamas County and County Service District-owned storm sewer outfalls that are not subject to the NPDES MS4 permit requirements. (See the areas outside the NPDES MS4 permit boundaries in Figures 2 and 3.)
- Privately-owned storm sewer outfalls if they do not drain agricultural and timber management areas. These outfalls, unless they are permitted by an NPDES permit such as a 1200Z, are non-point sources of pollution. (See the jurisdiction and land use maps in Figures 4, 5, 6, and 7.)
- Overland sheet flow or channelized flows that do not flow through MS4-permitted or privately owned storm sewer outfalls. These drainage systems are non-point sources of pollution. They are found on lands with every type of land use. Those drainage systems that are not in agricultural and timber management areas are addressed in this Implementation Plan. (See the jurisdiction and land use maps in Figures 4, 5, 6, and 7.)

It is important to note that Clackamas County's, CCSD #1's, and the City of Happy Valley's authority to control sources of pollution from privately owned storm sewer outfalls, overland sheet flow and channelized flows is quite limited. If Clackamas County, CCSD #1, and/or the City of Happy Valley are aware of a privately owned conveyance system that is either a significant or known source of pollution, the matter will be referred to DEQ if public education and/or mediation fail to yield the necessary water quality improvement.

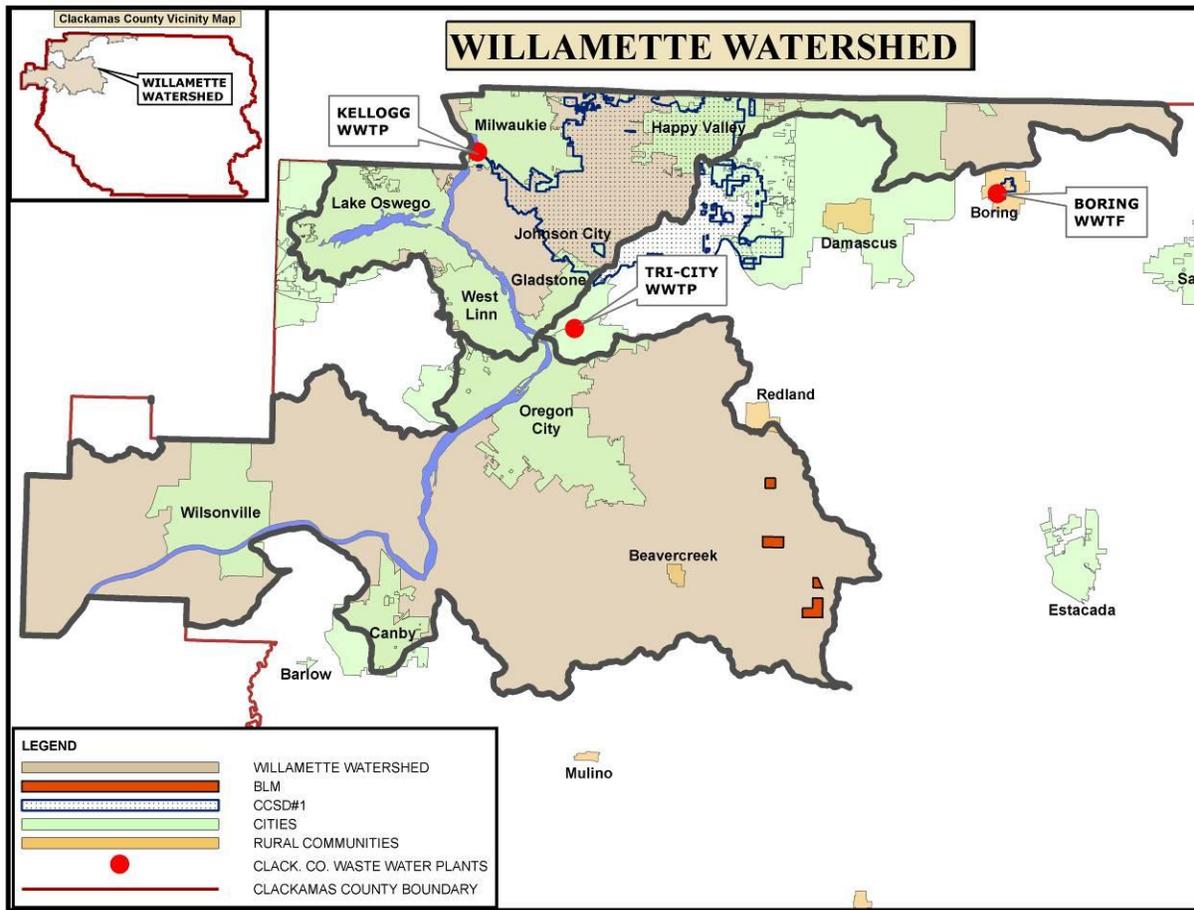


Figure 2. Jurisdictional Areas of the Willamette Watershed

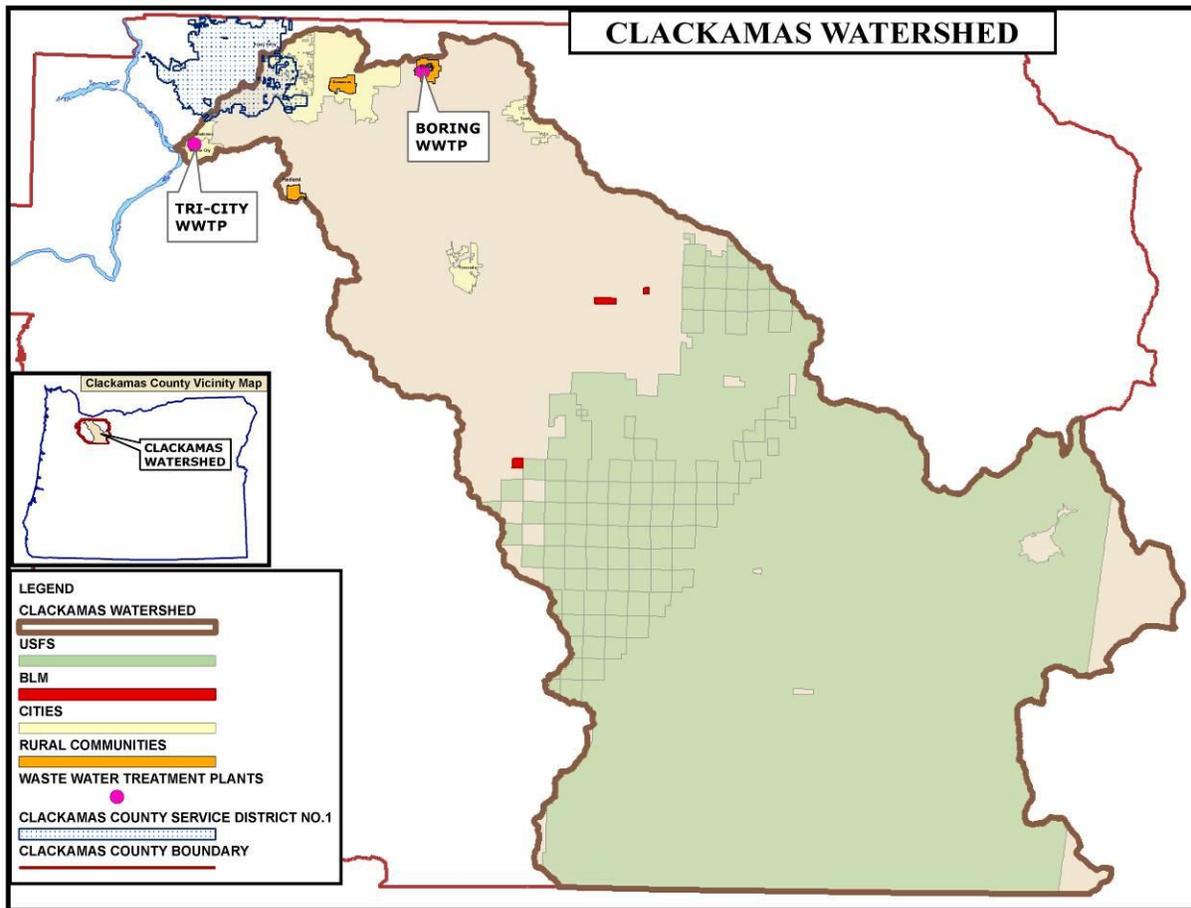


Figure 3. Jurisdictional Areas of the Clackamas Watershed

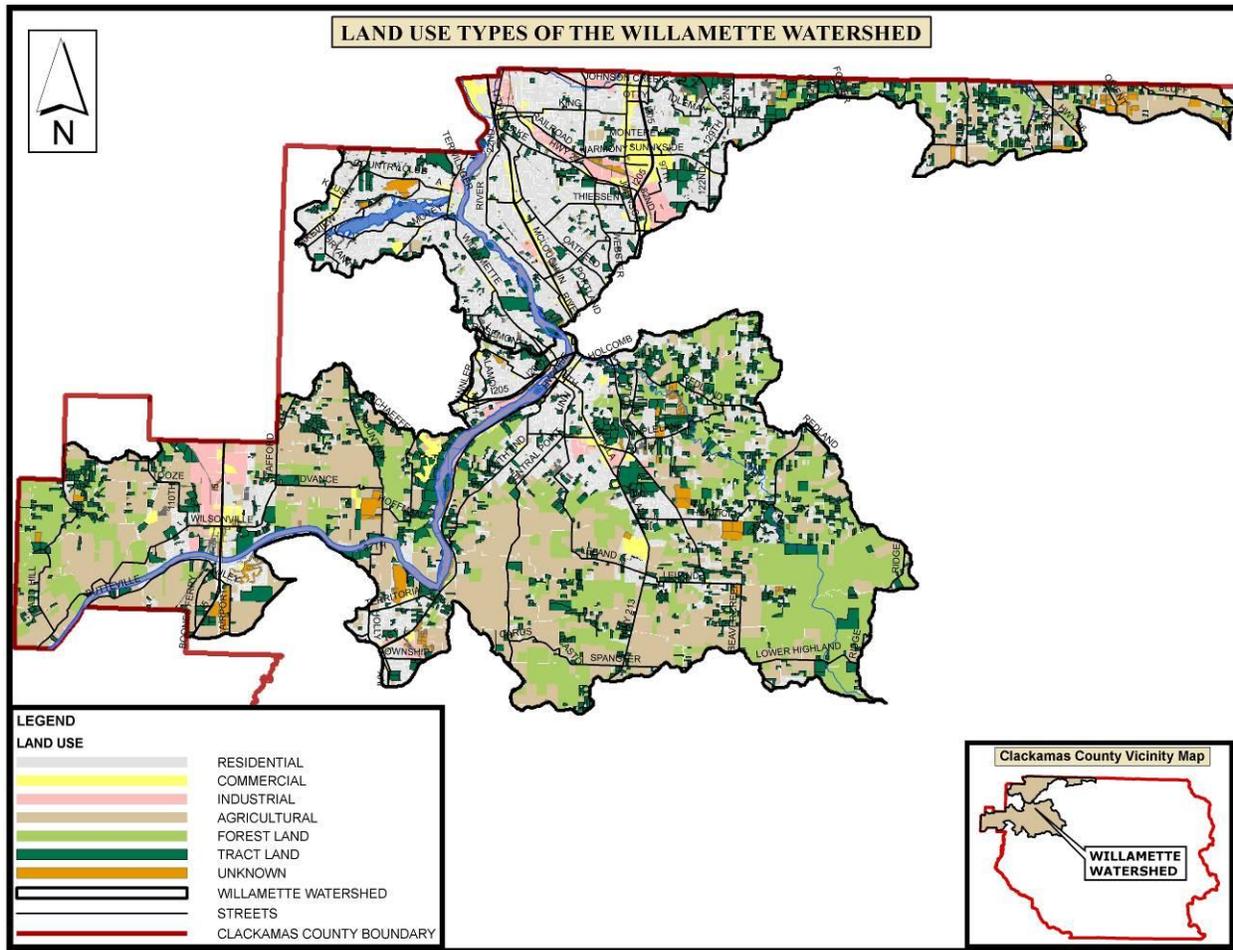


Figure 4. Land Use Types of the Willamette Watershed

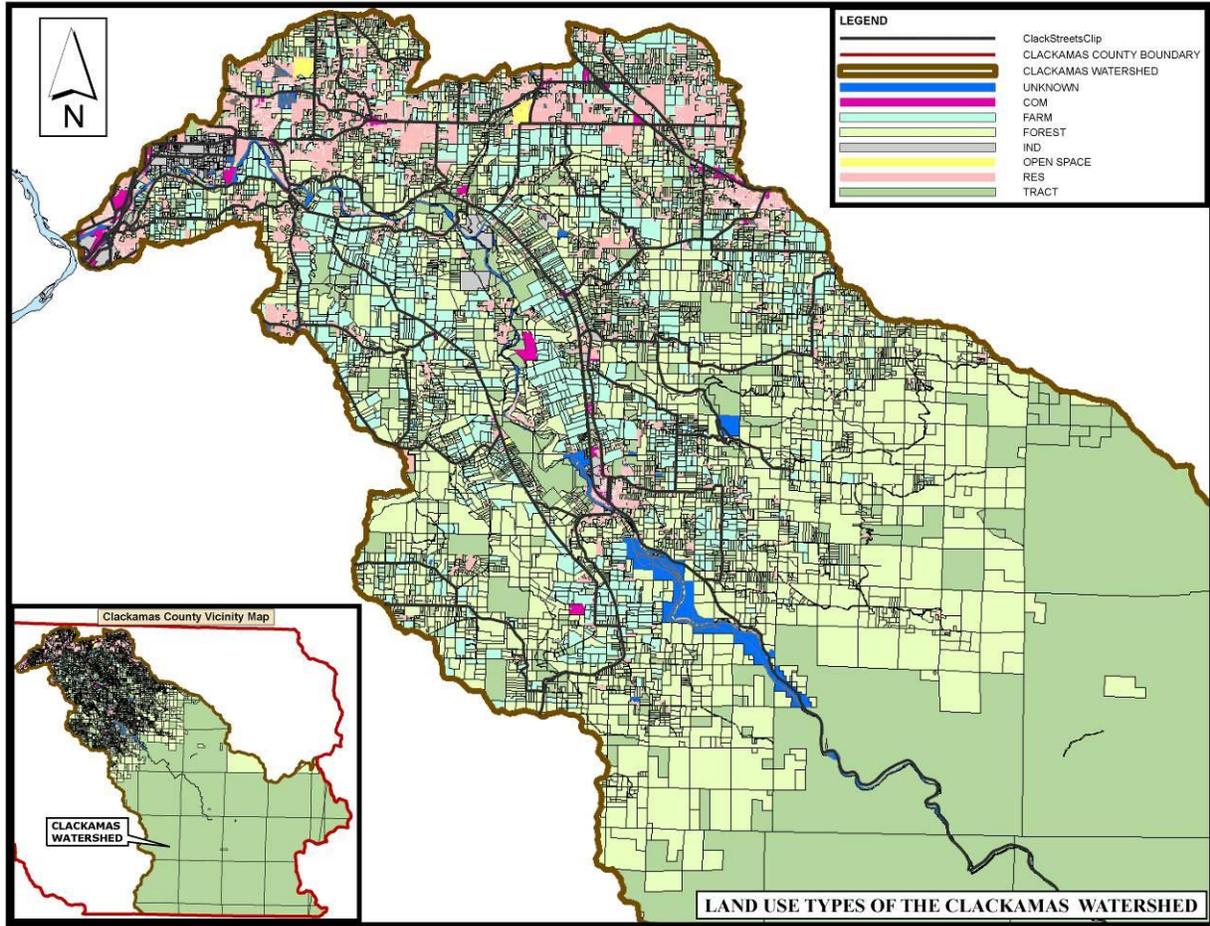


Figure 5. Land Use Types of the Clackamas Watershed

7. Clackamas County Water Quality Programs and Activities

A variety of management programs, activities, and strategies are employed by Clackamas County, CCSD #1, and the City of Happy Valley to improve and protect water quality and overall watershed health. The strategies that are implemented or planned for implementation to address non-point sources of TMDL parameters in the area covered by this Plan include:

- 7.1 Watershed Action Plans (WAPs)
- 7.2 Stormwater policies, regulations, and administrative procedures
- 7.3 Water quality monitoring
- 7.4 Industrial/Commercial stormwater maintenance program
- 7.5 Other development related and watershed protection regulations
- 7.6 Erosion prevention and sediment control
- 7.7 Public involvement and education
- 7.8 Pet waste management
- 7.9 Septic system management
- 7.10 Illegal dumping management
- 7.11 Dead animal management
- 7.12 Spill response and Illicit Discharge, Detection, and Elimination Program (IDDE)
- 7.13 Riparian assessment and management
- 7.14 CWR assessment and management

These management strategies are described in detail in the sections below. Applicable management strategies for each TMDL parameter are also summarized in the matrices in Section C: Implementation.

7.1 Watershed Action Plans WAPs

TMDL parameters addressed: *E. coli*, DDT, dieldrin, mercury, and temperature

Description of the potential sources: Watersheds can be impacted by development and impervious surfaces that contributes to or causes changes in hydrology, habitat, water quality, and biological communities. Stormwater, the runoff occurring from precipitation events, can pick up and convey pollutants as it travels over impervious surfaces and the land surface. In addition, alteration of riparian and upland vegetation can impact stream temperatures and watershed health.

Description of the Management Strategy: WES is planning to assess and improve watershed health using watershed assessments and WAPs. These assessments and WAPs will be conducted in cooperation and coordination with Clackamas County and the City of Happy Valley. WES plans to retain a consultant(s) and utilize a Technical Advisory Committee to develop WAPs for Kellogg-Mt. Scott (including Phillips, Dean, and Cedar); Rock (including Trillium); and Cow-Sieben (including Carli) watersheds. WES' WAP will be used to identify limiting factors and prioritize recommendations for watershed health and stormwater management activities and develop capital projects and programmatic measures to improve overall watershed health. The WAPs are expected to include assessments of data gaps; preliminary current opportunities and potential threats; the human/ built environment; current/future conditions; watershed functions and processes; watershed health attributes (hydrology, habitat, water quality, and biological communities); limiting factors; ranking criteria for improve-

ment projects; watershed management goals; implementation roles, planning level cost estimates for proposed improvement projects and a schedule for implementation.

Watershed health improvements are also addressed through the implementation of the existing Johnson Creek WAP via the Johnson Creek Watershed Council. Clackamas County provides financial support to the Johnson Creek Watershed Council and fills a Council seat as a one of the Jurisdictional Representatives. As a member of the Council, Clackamas County participated in the development of the original Johnson Creek WAP and is participating in the revisions to the WAP. Clackamas County also participates in the Johnson Creek Interjurisdictional Committee.

The WAPs will primarily focus on the more urbanized portions of unincorporated Clackamas County that are within CCSD #1, where revenue is collected for surface water management.

Timeline for implementation: The new watershed assessments and WAPs will be developed from 2008-2010.

Measurable milestones (if any): The WAPs will be used to develop prioritized watershed health recommendations, capital projects, and programmatic and policy measures to improve watershed health and to set management priorities for implementing stormwater management actions and activities. By 2010 the WAPs will be developed. By 2011 implementation of the WAP projects will begin. After 2011, progress implementing the WAPs will be evaluated for effectiveness and level of service through an adaptive management program.

Fiscal analysis: The County budgeted \$450,000 in Fiscal Year 2008-09 to retain a consultant to develop WAPs for the Kellogg-Mt. Scott; Rock; and Cow-Sieben watersheds. Implementation of the WAPs will require additional funding in the future.

7.2 Stormwater Regulations

TMDL parameters addressed: *E. coli*, DDT, dieldrin, and mercury

Description of the potential sources: After construction has been completed on a property, the storm sewer system and landscaping-related planning procedures and regulations that were followed during site design and construction can influence the amount of pollutants that are washed from the property into the nearest surface water body over the lifetime of the property's improvements.

Description of the Management Strategy: This portion of the Implementation Plan describes the planning procedures for developing, implementing, and enforcing controls to reduce the discharge of TMDL parameters from storm sewers which collect stormwater runoff from areas that have been significantly developed or redeveloped. These post-construction controls are applied to: a) development on private property, and b) Clackamas County and CCSD #1-funded capital improvement projects (CIPs) including road and building construction projects.

Clackamas County, CCSD #1, and the City of Happy Valley implement the following Management Strategies:

WES, Clackamas County and the City of Happy Valley (CCSD #1 Urban Growth Boundary [UGB])

Stormwater regulation services are only provided by WES in CCSD #1's UGB subunit, which includes the City of Happy Valley. Stormwater regulations are limited to newly developed or redeveloped properties which drain: 1) through privately owned storm sewer outfalls, 2) by overland sheet flow on private property, and 3) through privately owned ditches. Two primary Management Strategies are employed:

- a) Unless a waiver is granted, all new/redevelopment in CCSD #1's UGB subunit is required to infiltrate most of the runoff that is generated in any given year (the requirement is to infiltrate 100 percent of the first 0.5 inch of rain in every 24-hour period). This reduces potential pollutant loads, limits the increase in runoff volume that is created by development, and provides groundwater recharge. Full credit towards satisfying the infiltration requirement is routinely granted by WES for projects that use injection, such as through drywells, instead of infiltration. Reducing stormwater runoff volumes appears to be among the most effective techniques to reduce loading of TMDL parameters such as *E. coli* from upland areas.
- b) Unless a waiver is granted, WES' stormwater treatment requirements adopted in May 2000 also apply. Most stormwater treatment technologies, which generally are designed to reduce total suspended solids (TSS), may also be appropriate in reducing pollutant loading of mercury and insecticides such as DDT and dieldrin. Some treatment technologies also appear to reduce the loading of *E. coli* through filtration such as wet ponds, wetlands, rain gardens, and bioswales, and/or pervious pavement) and by providing enhanced residence times (which can increase the bacterial die-off rate). If stormwater filtration and/or enhanced residence time systems are constructed at a site, then *E. coli* loading could be expected to be lower than if these methods were not employed. For Clackamas County-funded and CCSD #1-funded capital improvement projects, stormwater treatment is often provided.

WES and Planning have co-sponsored utilizing in-kind local match of DEQ 319 grant funding that Metro has received. Two tasks envisioned to begin in 2008 include:

1. Complete a local jurisdiction code review to determine whether the code supports or impedes the use of habitat-friendly development practices. This review will include the jurisdiction's comprehensive plan, zoning code, development code, engineering design and construction manuals as well as capital improvement programs.

Deliverable: A document outlining the appropriate code sections, existing language, score (promote, partially support, impede, not addressed) and recommendations will be prepared for the local jurisdiction's use.

2. Convene and facilitate a discussion between the internal departments of a local jurisdiction regarding the limitations and possibilities of implementing habitat-friendly development practices. Possible internal departments include planning (long range/development review/permitting), engineering, building (inspectors/plan reviewers), and other staff the local jurisdiction deems is necessary to implement habitat-friendly development practices.

Deliverable: A document outlining department-working relationships, future coordination and opportunities, and proposed implementation plan will be prepared for the local jurisdiction's use.

Clackamas County Outside CCSD #1 UGB Subunit

For development of private property in areas regulated by the Willamette TMDL outside CCSD #1's UGB subunit, Clackamas County Department of Transportation and Development (DTD) does not administer any rules, regulations, or binding policies which require stormwater to be: a) treated, or b) retained for a length of time sufficient to cause significant bacteria die-off. However, County DTD is working with WES on an effort to adopt WES' stormwater quality and quantity design standards in 2009 for the unincorporated portions of the County.

For County-funded CIPs outside CCSD #1's UGB subunit, DTD will provide stormwater treatment, infiltration, injection, or retention to provide reduction of TMDL parameters as applicable.

Timeline for implementation: This management strategy is currently being implemented and is an ongoing activity.

Measurable milestones (if any): This management strategy will be evaluated annually for effectiveness and level of service. Adaptive management will be applied as appropriate to address limiting factors for watershed health. Assessment of this strategy will include tracking permit applications for new development and redevelopment sites, and tracking the types of stormwater management measures implemented at development sites.

Fiscal analysis: This management strategy is currently funded.

7.3 Water Quality Monitoring

TMDL parameters addressed: *E. coli*, DDT, dieldrin, mercury, and temperature

Description of the potential sources: Watersheds can be impacted by development and impervious surfaces that contributes to or causes changes in hydrology, habitat, water quality, and biological communities. Stormwater, the runoff occurring from precipitation events, can pick up and convey pollutants as it travels over impervious surfaces and the land surface. In addition, alteration of riparian and upland vegetation can impact stream temperatures. Monitoring the quality of rivers creeks and stormwater that is discharged to them provides information to assess current impairment, long-term trends, and the effectiveness of current management strategies and determine potential new management strategies to employ.

Description of the Management Strategy: Clackamas County WES conducts periodic stormwater and in-stream water quality monitoring. Monitoring is performed at eight in-stream sites in CCSD #1 nine times per year and four outfall sites in CCSD #1 three times per year. WES also supports several USGS continuous surface/stormwater monitoring stations. Other creeks and outfalls in Clackamas County are being monitored in a coordinated manner by Oregon City, West Linn, and Milwaukie.

Timeline for implementation: This management strategy is currently being implemented and is an ongoing activity.

Measurable milestones (if any): This management strategy will be evaluated annually for effectiveness and level of service. Adaptive management will be applied as appropriate to meet watershed health limiting factors and needs.

Fiscal analysis: Existing monitoring levels are currently funded. Additional funds for anticipated mercury analysis will be needed.

7.4 Industrial/Commercial Stormwater Maintenance Program

TMDL parameters addressed: *E. coli*, DDT, dieldrin, mercury

Description of the potential sources: Stormwater from commercial and industrial areas can wash TMDL parameters such as *E. coli*, DDT, dieldrin, or mercury into waterways regulated by the Willamette TMDL. Potential sources of contamination at these sites could include land deposition of air pollutants, spills, poor housekeeping practices, and leachate from improperly stored solid waste. The most common sources of *E. coli* at these sites may be feces deposited on impervious and landscaped surfaces by wild birds and mammals.

Description of the Management Strategy: The applicable Management Strategies vary depending on the location and type of facility. One set of potential Management Strategies applies for facilities that are located within CCSD #1 UGB and a different set applies to all other facilities in this Implementation Plan's geographic area of coverage.

CCSD #1 UGB

The WES "Non-Single-Family Residential Maintenance Agreement Program" (NSFRMAP) is expected to begin to be implemented in fiscal year 2008-2009. WES holds "maintenance agreements" with CCSD #1 owners of many of the properties that have been developed or significantly redeveloped since 1997 for multi-family residential, commercial, industrial, and religious purposes.

The NSFRMAP's agreements obligate the property's owners to clean and maintain their storm sewer system. While most of these properties discharge stormwater to the MS4 and drywells, some properties with NSFRMAP agreements discharge stormwater directly to Waters of the State through private storm sewer systems; these are the only properties enrolled in the NSFRMAP which are addressed by this Implementation Plan. Agreements under the NSFRMAP are exceptional, for they provide WES with some authority to compel owners of properties with agreements to provide some maintenance and cleaning work in privately-owned storm sewer systems that discharge directly to Waters of the State.

Letters from WES are expected to be sent in Spring 2009 to each facility's contact person that informs him/her that, according to their agreement: 1) storm sewer system maintenance and cleaning work may need to be performed soon, and 2) annual reports summarizing this work need to be submitted to WES.

If WES staff become aware that an industrial facility may be required to apply for and obtain a 1200Z NPDES permit from DEQ, WES staff will notify the business' owner(s) that they should contact the DEQ for a determination on their eligibility for this permit. While holders of 1200Z permits are generally not required to monitor for the presence of *E. coli* and other TMDL parameters in their stormwater, permit holders are required to regularly collect and analyze stormwater samples to ensure that stormwater leaving the facility complies with the permit's water quality benchmarks for many other pollutants, including TSS and lead. Facility improvements at 1200Z-permitted sites are often made to improve the quality of stormwater leaving the site so that levels of pollutants with

benchmarks are no longer elevated. It is possible that these improvements may also be reducing or preventing contamination of stormwater with TMDL parameters.

Industrial and Commercial facilities in CCSD #1 UGB which discharge stormwater runoff will primarily be inspected on a complaint-driven basis, but it is possible that some inspections will be conducted by WES staff during source tracking activity if WES' in-stream routine or in-stream storm event monitoring work reveals that excessive levels of *E. coli* or other TMDL parameters are present. All facilities that are the subject of a complaint will be contacted, and potentially inspected, in a timely manner by WES staff. The implementation of control measures for stormwater discharges from these facilities will be deemed necessary by WES if the presence of excess levels of *E. coli* or other TMDL parameters can be confirmed to be present in their discharge. In these instances, and in the event that the discharger's initial attempts to improve stormwater quality do not produce the required improvement, WES personnel will continue to provide guidance and technical assistance until the facility's stormwater quality improves.

If efforts by WES staff fail to achieve these goals, WES staff will contact the DEQ and request their support. The DEQ has the authority to compel most dischargers to halt or modify their discharge if the material contains a significant concentration of TMDL parameters and is likely to flow directly to Waters of the State.

Outside CCSD #1 UGB

For facilities that are not within CCSD #1 UGB and which do not discharge into Clackamas County's MS4, Clackamas County staff will contact the DEQ and request their support if a complaint is received about impaired stormwater quality, or if in some other manner, Clackamas County becomes aware of impaired stormwater flowing off of one of these facilities.

Timeline for implementation: The NSFRMAP is expected to begin to be implemented in fiscal year 2008-2009. The first annual letters to NSFRMAP property owners were sent Spring 2009, with ongoing work to follow.

Measurable milestones (if any): This management strategy will be evaluated annually for effectiveness and level of service. Adaptive management will be applied as appropriate to meet limiting factors for watershed health. Assessment of this strategy will include tracking annual letters sent to property owners in the NSFRMAP program identifying their requirements and tracking annual reports received from NSFRMAP property owners.

Fiscal analysis: Clackamas County has budgeted 0.1 FTE to implement the NSFRMAP.

7.5 Other Development-Related & Watershed Protection Regulations

TMDL parameters addressed: Temperature

Description of the potential sources: Removal or disturbance of vegetation reduces stream shading, exposing streams to higher levels of solar radiation. Solar radiation (sunlight) falling directly on streams can cause water temperature to increase. Alteration of the riparian canopy can also change the microclimate near streams, increasing air flow and heat exchange with the stream and thereby elevating water temperatures.

Description of the Management Strategy: Protection of system potential vegetation and effective shade in riparian areas is one of the primary mechanisms for achieving load allocations for temperature. The following watershed protection regulations that protect streamside vegetation are implemented in Clackamas County, CCSD #1, and the City of Happy Valley.

- ◆ *Streamside Buffer Areas:* Many lands that include at least some riparian area are subjected to “streamside buffer regulations” when these lands are developed or re-developed in a significant manner under Clackamas County’s and the City of Happy Valley’s building permitting process. Areas with streamside setbacks are illustrated in Figures 8 and 9. These streamside buffer regulations come in five forms:

Metro Title 3. WES currently administers the equivalent of Metro Title 3 regulations in CCSD #1. Clackamas County’s Planning Department administers these regulations in the other unincorporated areas within the Portland metro area’s UGB in Clackamas County, including but not limited to, the OLSD. Significant new and re-development that is regulated by Clackamas County near wetlands, springs, natural ponds, creeks, and rivers generally provides a largely undisturbed buffer area varying in width from 25 feet up to as much as 200 feet in certain cases. Buffer areas apply on each side of the creek or river. Wetland setback areas start at 50 feet from the delineated wetland boundary and can be larger depending on the surrounding topography. Creek buffer area width depends on several factors, including topography, whether the stream is perennial or intermittent, and how much contributing drainage acreage in the watershed is upstream of the proposed development.

The buffer area is protected in one of two ways: a conservation easement or a separate tract of land. In CCSD #1, if an owner proposes to encroach into WES’ buffer and can enhance the buffer by a) creating additional buffer on the property at a ratio of 1.5:1.0, then no other mitigation is required; or b) WES can authorize a customized vegetation plan that includes removing non-native species and replanting the buffer area with native vegetation, including shade-yielding trees.

The Planning Department will be taking over responsibility from WES for Title 3 within the Metro Service District boundary and the UGB. New code language that is consistent with Metro’s model ordinance will be proposed for adoption to facilitate the incorporation of Title 3 requirements into the County Zoning and Development ordinance.

- *OLSD.* The OLSD administers a separate streamside buffer regulation within their service area. A 25 foot setback area is applied on each side of the water body under this regulation. For qualifying developments which trigger the application of both the

OLSD and Metro Title 3 regulations, the application of the OLSD regulation is integrated with the application of Clackamas County's Metro Title 3.

- *Wetlands.* Clackamas County's Zoning and Development Ordinances (ZDO) 1002 and 709 apply in unincorporated, urban areas in the watershed. The "wetland provisions" of Sections 1002 and 709 of the ZDO regulate disturbances and specify setback distances for wetlands. Disturbances and setbacks to these wetlands are reviewed in accordance with applicable provisions of the ZDO and are dependent upon several factors that are determined on a case-by-case basis. ZDO 1002 and 709 are administered by Clackamas County's DTD. Wetlands are noted here in this Implementation Plan, for many wetlands in the Willamette River's watershed discharge their waters directly to creeks and rivers in the watershed.
- *Willamette River Greenway, ZDO 705.* The Willamette River Design Plan, described in the Clackamas County Comprehensive Plan, provides policy for reducing pollutants and protecting water quality outside of Water Environment Services (WES) District. Those policies are codified through Section 705 of the Zoning and Development Ordinance. The purpose statement of Section 705 (Willamette River Greenway), includes, in part "to maintain the integrity of the Willamette River by minimizing erosion, promoting bank stability and maintaining and enhancing the water quality and fish and wildlife habitats." While the specific pollutants considered through the TMDL process are not directly considered, one effect of the limitations on development provided through Section 705 is reduction/elimination of those pollutants. All intensification or change in use, or "development" requires a Greenway Conditional Use permit. Conditions of such permit include minimum setbacks of 100-150 feet (depending on slope, soils, density of existing vegetation, etc.), along with provision for/enhancement of a vegetative buffer of the same width. In addition, private noncommercial docks and moorages in the limited use rural portions of the Greenway are prohibited.
- *River and Stream Conservation Area, ZDO 704.* This ordinance applies to all unincorporated private lands in Clackamas County and is administered by DTD pursuant to the applicable provisions of the ZDO. Significant new and re-development which is regulated by Clackamas County that occurs on land lots near rivers and qualifying creeks must provide a largely undisturbed setback area varying in width from 50 feet to 100 feet (ZDO 704.07 requires that no less than 75 percent of the setback's area be preserved with native vegetation). For a river's riparian area, a setback area wider than 100 feet can be required in certain circumstances. The setback distance for creeks is based on whether a creek has been determined to be "small" (50 foot setback), "medium" (75 foot setback), or "large" (100 foot setback). Smaller (non-fish-bearing) streams and all wetlands are unprotected by ZDO 704's provisions. All riparian areas around creeks and rivers that are eligible for protection under ZDO 704 are on Water Protection Rule Classification maps that were compiled pursuant to OAR 629-635-000.

- *Floodplain Management District, ZDO 703.* This ordinance, administered by Clackamas County DTD, applies on the unincorporated lands that are addressed by this Implementation Plan. This ZDO restricts the types, and in some instances, the magnitude of development that can occur in floodplains. This ZDO tends to direct development away from areas that are directly adjacent to a creek or river's low and high flow channels, making it more likely that native vegetation will be allowed to provide shade to the water body (see the previous four bullets for regulations which formally establish riparian area setback areas).
- ◆ *Habitat Conservation District, ZDO 706 (Metro Title 13/Goal 5):* Clackamas County DTD has rewritten portions of the Metro Title 13 (Goal 5) model ordinance and associated maps for adoption by January 5, 2009. The City of Happy Valley will adopt Metro Title 13 (Goal 5) by ordinance in the City of Happy Valley jurisdictional area. The purpose of Title 13 is to (1) conserve, protect, and restore a continuous ecologically viable streamside corridor system, from the streams' headwaters to their confluence with other streams and rivers, and with their floodplains in a manner that is integrated with upland wildlife habitat and with the surrounding urban landscape; and (2) to control and prevent water pollution for the protection of the public health and safety, and to maintain and improve water quality throughout the region.

Metro has mapped the areas deemed to be regionally significant and has further designated as "Habitat Conservation Areas" (HCAs) those areas requiring protection. HCAs shall be protected, maintained, enhanced, and restored as specified in the Metro Code Section 3.07.1340, and city and county development codes shall include provisions for enforcement of these performance standards and best management practices. Discretionary development approval standards are designed to first avoid HCA's, next to minimize impacts on HCAs and water quality, and finally to mitigate the impacts to these areas.

- ◆ County Parks and North Clackamas Parks and Recreation District (NCPRD) are following their IPM plan. The Plan was adapted from the Portland Parks and Recreation plan and implemented in 2005.

Additionally, each city and county in the region shall identify provisions in the city's or county's comprehensive plan and implementing ordinances that prohibit or limit the use of a list of habitat-friendly development practices.

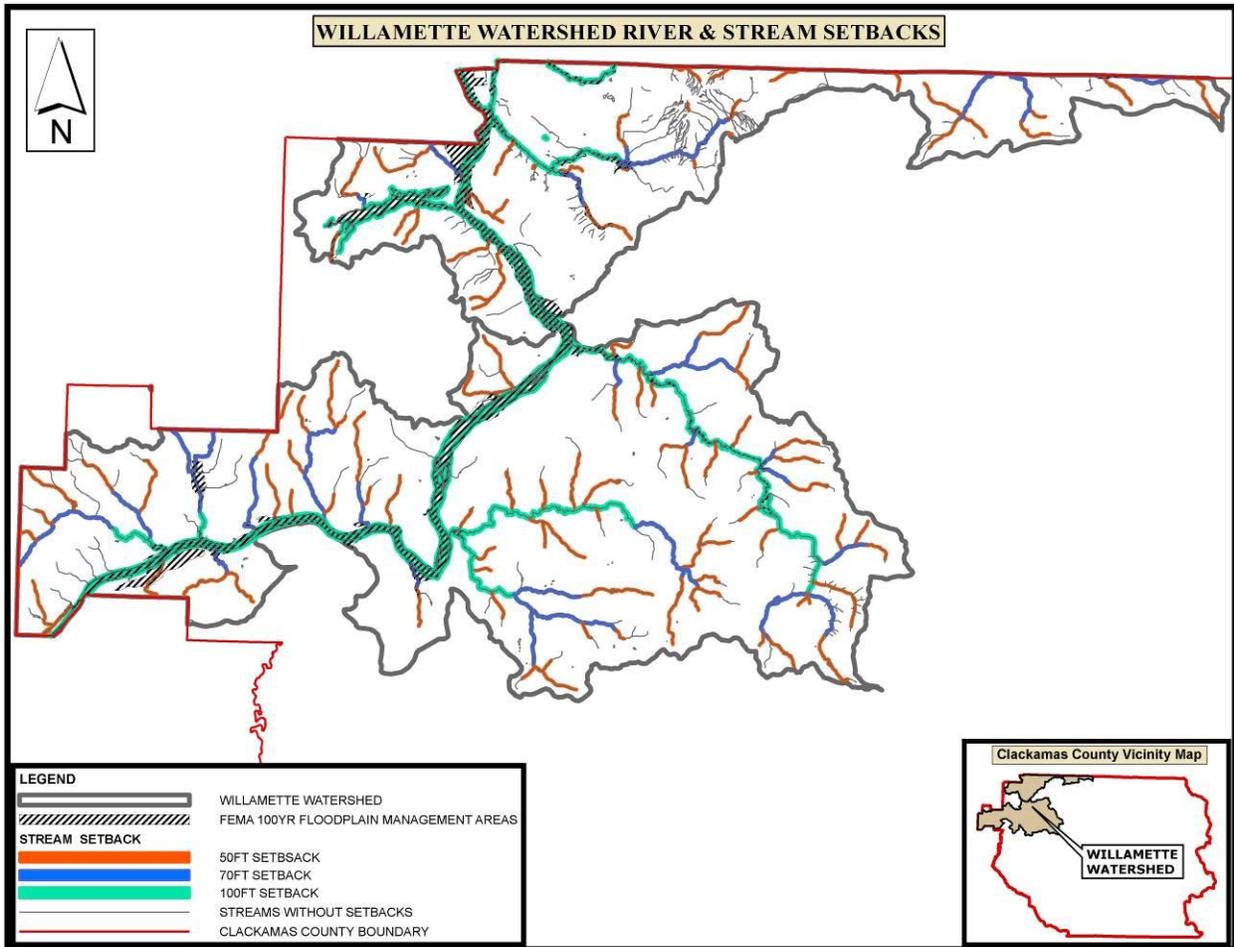


Figure 8. Willamette Watershed River and Stream Setbacks

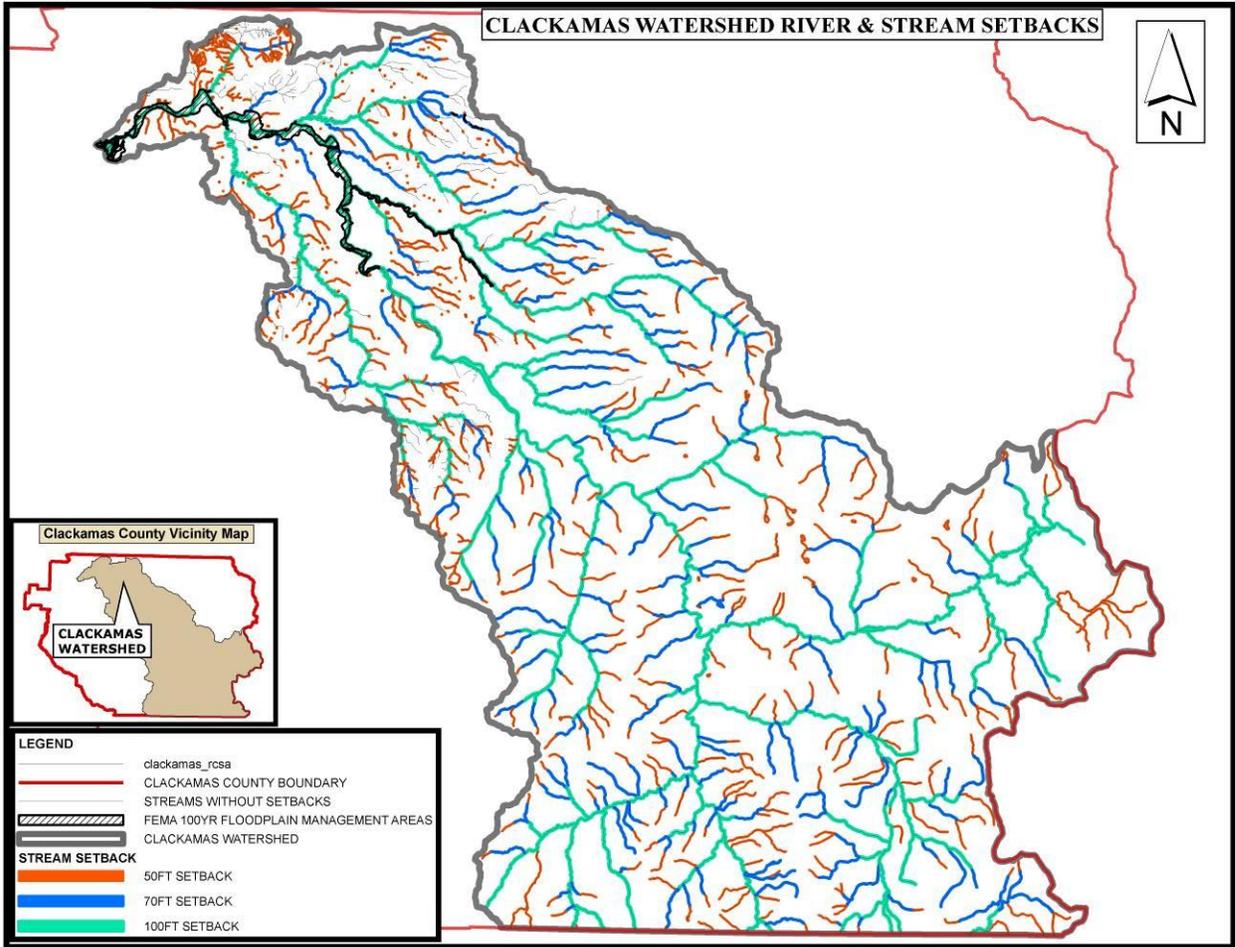


Figure 9. Clackamas Watershed River and Stream Setbacks

- ◆ *Sustainability Resolution:* Clackamas County established an Office of Sustainability in 2007. In a resolution, adopted February, 28, 2008, the Board of County Commissioner's adopted a resolution regarding sustainability. A portion of that resolution is listed below. Some of the elements of this resolution will aid in the implementation of management measures to control and reduce TMDL parameters:

We are committed to meeting or exceeding global targets for mitigating climate change by taking actions in our own operations and communities, including the following:

- a. Create an action plan for reducing global warming emissions in County operations;
- b. Increase the average fuel efficiency of County fleet vehicles;
- c. Increase recycling rates in County operations and in the community;
- d. Make County procurement decisions that minimize negative environmental and social impacts;
- e. Continue to practice and promote sustainable building practices using the U.S. Green Building Council's LEED™ program;
- f. Adopt and enforce land-use policies that reduce sprawl; preserve open space; create compact, walkable urban communities, and
- g. Protect and foster productive and healthy agriculture and natural resource lands;
- h. Make energy efficiency a priority, and increase the use of clean, alternative energy;
- i. Promote transportation options;
- j. Preserve water resources through education, planning and water supply coordination;
- k. Help educate the public, schools, other jurisdictions, professional associations, businesses, and industry about reducing the negative impacts of climate change.

While Clackamas County has existing language allowing low impact development, the sustainability project will facilitate a comprehensive policy review of our programs for regional impacts to water quality. The Sustainability Project will address these issues further through identifying possible methods to require all new projects to be "low impact."

- ◆ *Tree Ordinance.* The City of Happy Valley administers a tree ordinance in the city limits which provides some protection for some existing trees in both upland and riparian areas. The purpose of the ordinance is to regulate the removal of trees in order to preserve the wooded character of the City of Happy Valley, and to protect trees as a natural resource of the city. It is the intent of the tree ordinance to allow the prudent management of trees by individual property owners and developers where such management is in keeping with the purposes of the tree ordinance. In addition, the ordinance states that:
 - “No person shall remove a tree...without first obtaining a tree removal permit from the city.”
 - There are two types of permits: “A” and “B.” In most instances, type “A” permits—which have less stringent requirements than “B” permits—only pertain to the removal of up to three healthy (i.e., not dangerous/diseased/dying) trees per year on single-family residential lands. A type “A” permit cannot be issued for the removal of any trees that already receive protection from a previous condition of approval of development for the land.

Type “B” permit applications require that existing trees be surveyed before the permit can be issued. Drainage ways, wetlands, and surface water features shall be identified in this survey unless waived by the community development director. Under this permit, trees that are not to be removed are required to be protected with fencing or other markings to protect the space with the trees’ roots and the surrounding vegetation. A “tree bank” may be used by the property owner if tree cutting is permitted by the City and if it is not feasible or desirable to relocate or replace trees on the same site. In these instances, the property owner, builder, or developer shall make a financial contribution to the city’s “tree bank” equal to \$250.00 per tree.

According to 16.20.090(F), which only pertains to land construction and development-related tree removal actions (which require the issuance of a Type “B” permit): “Removal of trees will not be allowed within thirty (30) feet of the high water mark on either side of an identified drainage way. An identified drainage way shall be one that is identified on a U.S. Geological Survey 7.5 Minute Quadrangle Map...No tree may be removed from an identified drainage way unless such tree is determined by a city representative to be a dangerous tree. For any drainage way that is not identified upon the...Map, the permittee shall have the burden of demonstrating that the tree removal sought will not cause or contribute to erosion. The city may require that added erosion control measures be implemented to prevent erosion. The city may require additional documentation substantiating a claim of dangerous circumstances alleged to necessitate the removal of trees from within an identified drainage way. This request for information may include, but is not limited to, a certified arborist report confirming the danger posed by the tree(s) in question.”

In addition, Clackamas County is currently considering its own tree ordinance. The County is researching various tree ordinances and is conducting an urban tree canopy coverage survey. The tree ordinance discussions developed out of citizen concerns from a group entitled, “Urban Green.”

Timeline for implementation: This management strategy is currently being implemented and is an ongoing activity.

Measurable milestones (if any): This management strategy will be evaluated annually for effectiveness and level of service. Adaptive management will be applied as appropriate to address limiting factors for watershed health. Assessment of this strategy will include:

- ◆ Tracking the number of approved building and development permits per year with riparian area buffers or setbacks.
- ◆ Tracking the number and acreage of HCA's protected, mitigated, or restored.
- ◆ Tracking the number of approved building permits per year which receive a ZDO 703 review.
- ◆ Tracking the number of approved building permits per year with wetland riparian area buffers.
- ◆ Qualitative assessment through interviews with staff.

Fiscal analysis: Implementation of Metro Title 3 equivalent stream buffer regulations, river and stream conservation areas (ZDO 704), the floodplain management district (ZDO 703), and wetland provisions of ZDO 1002 and 709 is currently funded. Implementation of Metro Title 13 (Goal 5) in Clackamas County and the City of Happy Valley will require additional resources, estimated at approximately \$100,000 for Clackamas County and \$25,000 for the City of Happy Valley. Implementation of the City of Happy Valley's tree ordinance may require additional resources as well.

Timeline for implementation: Clackamas County will adopt Title 13 by January 5, 2008. Other management strategies are currently being implemented. Implementation will continue.

7.6 Erosion Prevention and Sediment Control

TMDL parameters addressed: DDT, dieldrin, and mercury

Description of the potential sources: Erosion of disturbed soil at construction sites can result in stormwater being contaminated with sediment and other pollutants, which can then be transmitted to waterways. Mercury is naturally present in some soils and also reaches soil through air deposition. DDT and dieldrin may be present in some soils due to spills or improper storage.

Description of the Management Strategy: Erosion control is addressed through the issuance of erosion control permits for sites undergoing significant development or redevelopment, reducing the amount of soil leaving the site and subsequent TSS in stormwater washing from the property. By reducing TSS in stormwater, it is presumed that the concentration in stormwater of TMDL parameters adhered to soil (such as DDT, dieldrin, and mercury) if present is also reduced.

The implementation of the erosion control program varies depending on the location of the property being developed. One set of Management Strategies applies for sites that are located within CCSD#1, a second set applies outside of CCSD#1 but still within the UGB, a third set applies in the City of Happy Valley, and a fourth set applies to all other lands in this Implementation Plan's geographic area of coverage. The erosion control methods employed at these permitted sites include in-

stallation of sediment fence and catch basin silt sacks, planting grass to re-stabilize disturbed areas, and other similar techniques.

- ◆ *Sites within CCSD #1 (and the City of Gladstone).* For portions of CCSD #1 that are not within the City of Happy Valley, erosion control permits are required for sites where 800 or more square feet of soil are disturbed during construction. For instances where soil disturbance occurs yet is exempt from permitting requirements, technical assistance on erosion prevention and sediment control is provided by WES staff either on request or by complaint. Construction sites where one or more acres of soil disturbance occurs or is expected to occur are required to have a NPDES 1200-C permit. This permit is administered by WES, serving in the capacity as an agent of DEQ. WES administers both of these erosion programs within the City of Gladstone city limits through an IGA with the City.
- ◆ *Sites outside of CCSD#1 but within the UGB (outside of incorporated cities except Gladstone).* For 1200-C sites in this geographic area, this permit is administered by WES, serving in the capacity as an agent of DEQ. For non 1200-C sites, DTD is the designated service provider. At this time, though DTD has erosion control in its design standards, there is not a program or permit for these sites. In conjunction with the WAPs, DTD and WES are currently evaluating methods and costs of implementing an erosion prevention and sediment control program for this area. Among the options to be considered is an IGA with WES to extend the geographic coverage of their existing erosion prevention and sediment control program.
- ◆ *Sites within the City of Happy Valley.* Erosion control permits are required for sites where 800 or more square feet of soil are disturbed during construction. For instances where soil disturbance occurs yet is exempt from permitting requirements, technical assistance on erosion prevention and sediment control is provided by City staff either on request or by complaint. NPDES 1200-C sites within the City limits are administered by DEQ.
- ◆ *Unincorporated Clackamas County outside CCSD #1 and the UGB.* In these geographic areas, the only type of erosion control permit which is required is the NPDES 1200-C and is administered by WES. DTD and WES are currently evaluating methods and costs of implementing an erosion prevention and sediment control program for this area. Among the options to be considered is an IGA with WES to extend the geographic coverage of their existing erosion prevention and sediment control program.

The Clackamas County Road Department occasionally disturbs soil in their road rights-of-way while performing routine road maintenance and repair work. Clackamas County's Road Department recently began the process of adhering to the Oregon Department of Transportation's *Routine Road Maintenance, Water Quality and Habitat Guide, Best Management Practices, Revised 2004* (ODOT Guide). In 2007, DTD submitted an Endangered Species Act (ESA) 4(d) Limit seeking coverage under the Routine Road Maintenance No. 10 Limit. Proper erosion prevention and sediment control methods are addressed under several activities within the ODOT Guide, including but not limited to Activity #120 (Ditch Shaping and Cleaning), Activity 112 (Shoulder Rebuilding), and Activity 081 (Stockpiling). In addition, DTD has been issued a 1200-CA permit (a version of the 1200-C permit that is solely for local agencies). Capital Improvement and maintenance projects are performed by DTD in accordance with the requirements of the 1200-CA.

As a further service, the City of Happy Valley and WES both provide the following programs in their

respective service areas:

- In response to the development community's request for more education on erosion prevention and sediment control, in fiscal year 2006-2007 WES and Happy Valley continued to partner with the Home Builders Association of Metropolitan Portland, Clackamas Community College, and the Cities of Milwaukie and Oregon City on an Erosion Control Certification program. Four hours of training in erosion control every two years provides individuals the opportunity to be certified and eligible for a discount on erosion control permits. This program went into effect November 1999 and is expected to continue through fiscal year 2007-2008 and possibly into the near future.
- In 2001, WES partnered with regional jurisdictions, the Oregon Association of General Contractors, the Homebuilders Association of Metropolitan Portland and vendors of erosion control products to create and promote the Annual Regional Erosion Prevention Awards Program. The City of Happy Valley joined this partnership several years later. Developed to provide recognition for contractors and developers with outstanding achievements in exceeding local erosion control requirements, the program provides recipients with media recognition, peer recognition, and prizes donated by vendors of erosion prevention and sediment control products and services.

The Annual Regional Erosion Prevention Awards Program provides the development community with incentives to seek education regarding erosion prevention BMPs, improve BMP selection and installation, and to better monitor and maintain the BMPs used in their projects. Additional benefits of the program are to provide education for the jurisdiction's inspection staff, progress towards standardization of erosion prevention requirements, and a reduction in noncompliance with erosion control requirements. As of 2007, participants include approximately 25 jurisdictions in 5 counties in Oregon and southern Washington. The awards were given for the Sixth Annual event on June 8, 2007 and received media coverage in the Daily Journal of Commerce and other trade publications. This program is expected to continue through fiscal year 2007-2008 and possibly into the near future.

Timeline for implementation: This management strategy is currently being implemented and is an ongoing activity.

Measurable milestones (if any): This management strategy will be evaluated annually for effectiveness and level of service. Adaptive management will be applied as appropriate to address limiting factors for watershed health. Assessment of this strategy will include tracking erosion control permits issued, inspections performed, enforcement actions taken, and education and outreach activities implemented. In the future, turbidity monitoring may also play a role in assessment of program effectiveness and in terms of future regulatory compliance with the outcome of the proposed and pending turbidity rule.

Fiscal analysis: This management strategy is currently funded for CCSD #1 and the City of Happy Valley; however additional resources may be needed in the future. Additional resources may be needed to fully implement this management strategy in DTD service area.

7.7 Public Involvement and Education

TMDL parameters addressed: *E. coli*, DDT, dieldrin, mercury, and temperature

Description of the potential sources: Land management decisions on private lands and activities conducted by the public throughout the watershed affect overall watershed health and may contribute to the release of TMDL parameters into waterways. Educating the public about the way their practices can negatively or positively impact the health of the watershed is an important component in managing these potential sources.

Description of the Management Strategy: Public involvement and education is targeted by Clackamas County DTD and WES to encourage citizens to work and live in ways that protect or improve water quality. Public involvement and education is a part of many water quality management strategies implemented in Clackamas County including pet waste education and management, septic system education and management, responding to and preventing illegal solid waste dumping, addressing dead animals on County roads, spill response, industrial/commercial stormwater maintenance, erosion prevention and sediment control, and design/construction standards for new/redevelopment management strategies. Specific activities and strategies employed by Clackamas County to reduce potential sources of *E. coli*, DDT, dieldrin, mercury, and temperature are described below.

E. coli

Public involvement and educational activities intended to reduce *E. coli* load contributions to waterways include the following:

- ◆ Educating the public about how to prevent septic system failures and how to report failures when they occur. This information is provided in brochures, on WES' website, and on request when citizens contact WES in person, by phone, e-mail, or U.S. mail.
- Clackamas County's *Citizen News* newsletter. *Citizen News* is U.S. Mailed to every Clackamas County address four times per year. The summer 2007 issue's page 6 contained a large (3/4 page) article on the proper way to care for a home's septic system. Proper care of septic systems prevent the discharge of sewage (and thus bacteria) into surface water bodies.

The spring 2006 issue contained an article titled "Buffer Zones: Protecting Sensitive Creeks and Streams", which as the title suggests, encouraged citizens to maintain their healthy—and enhance their degraded—riparian areas. Healthy riparian areas infiltrate, transpire, and filter non-point source stormwater runoff, and can reduce or assist in eliminating *E. coli* loading to streams and creeks, and may contribute to reducing water temperatures in receiving waterbodies.

One or more future newsletters may possibly include an article on one or more of the following topics that have the potential to further reduce in-stream *E. coli* loading levels:

- "Reasons why you should not feed ducks and geese"
- "Proper management of dog and cat wastes"
- "Please take your RV to an approved dump site after your vacation"

- Clackamas County Fair. In August 2007, WES employees staffed the County’s booth at the Fair during about one-quarter of the time that the Fair was open, and WES literature was available and distributed to the public from the booth during all hours that the Fair was open. Clackamas County employees distributed the literature during the times when WES employees were not in the booth. It is expected that WES employees will continue to staff the County’s booth about one-quarter of the time during Fairs in future years. When citizens visit the booth during the Fair, WES literature provides information to the public on various bacteria-related subjects, including proper pet waste management and the value of proper maintenance of septic systems, and if WES staff are present in the booth at the time, additional information, advice, and guidance is provided on water quality and watershed health related issues.
- Clackamas County’s Dog Services provides information about proper dog waste management to the general public. For example, during a special event in June 2006, “dog poop scoops” were provided as free gifts to citizens to motivate dog owners to clean up after their pets.
- North Clackamas Parks and Recreation District manages many parks within the Willamette watershed. At each of these parks signs have been placed notifying visitors that picking up their dog waste is a rule at all Parks. Bag dispensers have been placed at most if not all parks to help facilitate this process.

The following Clackamas County park facilities are not owned by the North Clackamas Parks & Recreation District but are located in the area that is regulated by the Willamette River watershed’s *E. coli* TMDL: Barton, Hebb, Eagle Fern, Carver Boat Ramp, Metzler Parks, and the Stone Creek Golf Club. At each of these facilities, a bag dispenser is present—or soon will be—so that education can be provided to dog owners and they can clean up after their dog.

- Park rules, including the rule to dispose of your dogs waste are listed in our Clackamas County Parks “Park Guide” which is widely distributed; 5,000-10,000 annually.
- In 2008, an educational brochure was created to highlight the parks commitment to ecosystem health including; disposal of dog waste; appropriate disposal of trash waste; restoration of ecosystem structure and functions including and highlighting riparian buffers. These brochures get handed out at many events per month, they contain links of how to obtain more information, and highlight our partnerships with other county agencies.
- The Clackamas County Soil & Water Conservation District (CCSWCD). The CCSWCD provides assistance to landowners who are interested in conservation and watershed enhancement. While the CCSWCD is not a department of Clackamas County, it is noted here because for Clackamas County and the CCSWCD work closely together. The CCSWCD helps landowners identify, plan for, and implement conservation measures that reduce pollutants coming off their lands including *E. coli* contamination through wise management of livestock manure, pet waste (this can include horses), and by installing vegetated buffer areas that allow stormwater to infiltrate into, be evaporated by, or filtered through the vegetated area. In November 2006, Clackamas County voters

ected to increase their taxes and provide a stable funding source for the CCSWCD, allowing the CCSWCD to increase the level and quality of the services it provides.

- ◆ Within CCSD #1 UGB, WES provides additional public education and involvement opportunities that may reduce *E. coli* loading from open and piped privately owned drainage systems. These include, but aren't limited to:
 - a) Providing updates to the WES' website, which encourages citizens, customers, and stakeholders to pick up their pet's waste, maintain septic systems, naturescape their yard to increase infiltration (to eliminate runoff of contaminated stormwater), etc.
 - b) Providing educational opportunities to school-age children. In the past, this has included presentations/stories/music in their classrooms and co-sponsorship of the Children's Clean Water Festival.
 - c) River Health Advisory Board (RHAB). The RHAB meets monthly, advises WES and the Board of County Commissioners on all aspects of WES' sanitary sewer and surface/stormwater management programs.
 - d) Media campaigns, which are usually implemented and funded in partnership with many local governmental agencies. A recent example of a relevant campaign which WES contributes funds toward is the "Canines for Clean Water Campaign." The campaign obtains voluntary pledges from dog owners to "keep our water clean by...scooping and disposing of dog waste in a garbage can...". While much of this specific campaign's emphasis is targeted towards the Tualatin River watershed, WES also asks dog owners in CCSD #1 UGB to make the same pledge.
 - e) The NCPRD has just recently funded and hired its first Natural Resources Coordinator position. The duties of this position are expected to generally include but not be limited to: natural resource assessments and conducting master plans; review of maintenance practices; best management practice implementation; along with restoration, enhancement, and public education and stewardship activities.
 - f) Watershed signs. These signs are currently displayed at 43 separate locations in or adjacent to CCSD #1 UGB where County roads cross a river, creek, or significant tributary. These signs advertise the "watershed concept"...that lands surrounding these crossing points drain to creeks and rivers. WES believes that some citizens will be more likely to respond to our water quality protection and improvement-related initiatives and programs if they are more familiar with the waterbodies they live within, commute to and from, and potentially affect. The signs are in the following watersheds:
 - Clackamas River watershed –17 locations
 - Kellogg-Mt. Scott Creek watersheds – 22 locations
 - Johnson Creek watershed – 4 locations

DDT, Dieldrin, and Mercury

Public involvement and educational activities intended to reduce DDT, dieldrin, and mercury concentrations and pollutant loadings to waterways include the following:

- ◆ In July 2005, using in-kind support and some 319 grant funds from EPA that were awarded to the Johnson Creek Watershed Council by DEQ, the Inter-jurisdictional Committee (IJC) for Johnson Creek published a “fact sheet” titled *Johnson Creek, Legacy Pesticide Study, 2003-2005*. This fact sheet, created specifically for distribution to the watershed’s property owners and residents, was dedicated to the awareness of and addressing DDT and dieldrin prevalence in the creek’s waters and sediments. In Summer 2005, about 600 copies of the fact sheet were U.S. mailed to streamside residents in the watershed, about half of whom reside in Clackamas County. Although WES intends to continue to distribute this fact sheet to CCSD #1 ratepayers upon request, in the future, it may be placed on WES’ website, and/or it may be distributed at special events, such as the County Fair.
- ◆ Clackamas County’s *Citizen News* newsletter. *Citizen News* is sent via U.S. mail to every Clackamas County address, including those in the Johnson Creek watershed, four times per year. The summer 2005 issue contained an article titled “Keeping the dirt where it belongs.” This large (1/2 page) article addressed the fact that excessive human-caused soil erosion can be harmful to aquatic life, then provided information on ways to control erosion at construction sites. The spring 2006 issue contained an article titled “Buffer Zones: Protecting Sensitive Creeks and Streams”, which as the title suggests, encouraged citizens to maintain their healthy—and enhance their degraded—riparian areas. The spring 2006 article specifically stated that healthy riparian areas “minimize erosion.” One or more future *Citizen News* newsletters may possibly carry other articles that encourage citizens to reduce or prevent soil erosion on property that they own or rent.
- ◆ *Clackamas County Fair*. In August 2007, WES employees staffed the County’s booth at the Fair during about one-fourth of the time that the Fair was open, and WES literature was available and distributed to the public from the booth during all hours that the Fair was open. Clackamas County employees distributed the literature during the times when WES employees were not in the booth. It is expected that WES employees will continue to staff the County’s booth about one-fourth of the time during Fairs in future years. When citizens visit the booth during the Fair, WES literature provides information to the public on the benefits of (and recommended way to) prevent and minimize soil erosion. If WES staff are present in the booth at the time citizens visit, additional information, advice, and guidance on this subject is provided.
- ◆ Metro’s Household Hazardous Waste Facility in the City of Oregon City was also mentioned in the discussion of Illegal Disposal of Solid Waste Management Strategies. Metro’s public involvement program encourages citizens to take unused amounts of hazardous wastes including insecticide products there for disposal. When inquiries from the public about the proper disposal method for potentially harmful substances (such as empty containers that once held pesticide/herbicide, unwanted quantities of pesticides/herbicides, and mercury-containing products) are received by WES, the City of Happy Valley or Clackamas County, citizens are promptly forwarded to Metro’s informational phone number (503-234-3000).
- ◆ CCSWCD. The CCSWCD provides assistance to landowners who are interested in conservation and watershed enhancement. While the CCSWCD is not a department of Clackamas County, it is noted here because Clackamas County and the CCSWCD work closely together. CCSWCD helps landowners identify, plan for, and implement conservation measures that reduce soil erosion in many ways (for example, by installing vegetated buffer areas that allow stormwater to infiltrate into, be evaporated by, or filtered by the vegetated area). In No-

vember 2006, Clackamas County voters elected to increase their taxes and provide a stable funding source to CCSWCD, allowing CCSWCD to increase the level and quality of the services it provides to landowners.

- ◆ The Johnson Creek Watershed Council (JCWC) is actively engaged in reducing non-point sources of water pollution in the watershed. Their mission is “To inspire and facilitate community investment in the Johnson Creek Watershed for the protection and enhancement of its natural resources.” WES works closely with the JCWC and contributes limited funding (due to the very minimal acreage of the Johnson Creek watershed that is currently within CCSD #1) to the JCWC.
- ◆ Within CCSD #1 UGB, including the City of Happy Valley, WES provides additional educational and involvement opportunities that may reduce discharges of DDT and dieldrin from open and piped privately owned drainage systems. As was noted in Source item #7 (Erosion Control Programs), WES and the City of Happy Valley provide educational information about their erosion control permit-based programs to program customers, stakeholders, and other interested parties. WES’ additional work includes, but isn’t limited to:
 - a) Providing updates to the WES’ website. A relevant example involves advertising naturescaping workshops on the website. A naturescaped area—one with native plants and proper soil cover—has little or no soil erosion, for precipitation which falls there tends to infiltrate, rather than runoff as stormwater.
 - b) Providing educational opportunities to school-age children. This includes presentations/stories/music in their classrooms and co-sponsorship of the Children’s Clean Water Festival.
 - c) River Health Advisory Board (RHAB). RHAB meets monthly, advises WES and the Board of County’s Commissioner’s on all aspects of WES’ sanitary sewer and surface/stormwater management programs.
 - d) Watershed signs are currently displayed at 43 separate locations in or adjacent to CCSD #1 UGB where County roads cross a river or significant tributary. These signs advertise the “watershed concept”...that lands surrounding these crossing points drain to creeks and rivers. WES believes that some citizens will be more likely to respond to our water quality protection and improvement-related initiatives and programs if they are more familiar with the waterbodies they affect. The signs are in the following watersheds:
 - Clackamas River watershed –17 locations
 - Kellogg-Mt. Scott Creek watersheds – 22 locations
 - Johnson Creek watershed – 4 locations

Temperature

Public involvement and education is targeted by Clackamas County, WES, the City of Happy Valley, and CCSD #1 to encourage citizens to maintain their existing healthy riparian areas, and to encourage them to enhance degraded riparian areas that are on their property. Riparian area-related public involvement and educational opportunities available to the citizens and property owners in the area regulated by the Willamette temperature TMDL are present in many forms, including, but not limited to the following:

- ◆ Clackamas County's *Citizen News* newsletter. This newsletter is U.S. Mailed to every Clackamas County address, four times per year. The spring 2006 issue, for example, contained an article titled "Buffer Zones: Protecting Sensitive Creeks and Streams", which as the title suggests, encourages citizens to maintain their healthy—and enhance their degraded—riparian areas.
- ◆ *Clackamas County Fair*. In August 2007, WES employees staffed the County's booth at the Fair during about one-fourth of the time that the Fair was open, and WES literature was available and distributed to the public from the booth during all hours that the Fair was open. Clackamas County employees distributed the literature during the times when WES employees were not in the booth. It is expected that WES employees will continue to staff the County's booth about one-fourth of the time during Fairs in future years. When citizens visit the booth during the Fair, WES literature provides information to the public on the benefits of (and recommended way to) perform riparian restoration or protection. If WES staff are present in the booth at the time citizens visit, additional information, advice, and guidance on this subject is provided.
- ◆ NCPRD formed a partnership with Johnson Creek Watershed Council, SOLV, the Overland Neighborhood association and other businesses and individual volunteers to work on a 5 mile section of Johnson creek. Objectives are as follows for in-stream and riparian habitat; trash clean up and education on trash disposal, control non-native plants and education on native plant restoration, field education and implementation of buffer restoration. First annual event 2008
- ◆ NCPRD is working to provide education opportunities for Environmental Youth Corps members, school groups, private company and non-profit groups, and individual volunteers to help restore riparian habitats through restoration work events. These events highlight specific topics such as canopy cover, non-native plant invasion and soil erosion and health.
- ◆ *CCSWCD*. CCSWCD provides assistance to landowners who are interested in conservation and watershed enhancement. While the CCSWCD is not a department of Clackamas County, they are noted here for Clackamas County and the CCSWCD work closely together. They routinely assist landowners with identifying, planning, and undertaking riparian area protection and enhancement projects.
- ◆ Within CCSD #1 UGB and the City of Happy Valley, WES provides additional educational and involvement opportunities that encourage the public to support watershed health and may reduce non-point source in-stream heat loading. These include, but aren't limited to:
 - a) Providing updates to the WES' website, which also encourages the public to live and do business in ways which would reduce non-point pollutant sources, maintain healthy riparian areas, and implement best management practices that would contribute to watershed health and assist in lowering stream temperatures.
 - b) Providing educational opportunities to school-age children about watershed health.
 - c) River Health Advisory Board (RHAB). RHAB meets monthly, advises WES and the Board of County Commissioner's on all aspects of WES' sanitary sewer and surface/stormwater management programs.

- d) Watershed signs are currently displayed at 43 separate locations in or adjacent to CCSD #1 UGB where County roads cross a river, creek, or significant tributary. These signs advertise the “watershed concept”...that lands surrounding these crossing points drain to creeks and rivers. WES believes that some citizens will be more likely to respond to our water quality protection and improvement-related initiatives and programs if they are more familiar with the waterbodies they affect. The signs are in the following watersheds:
- Clackamas River watershed –17 locations
 - Kellogg-Mt. Scott Creek watershed – 22 locations
 - Johnson Creek watershed – 4 locations

Timeline for implementation: This management strategy is currently being implemented and is an ongoing activity.

Measurable milestones (if any): This management strategy will be evaluated annually for effectiveness and appropriate level of service. Adaptive management will be applied as appropriate to address limiting factors for watershed health. Assessment of this strategy will include performing qualitative assessments through interviews with staff and our customers as well as tracking public education and outreach metrics such as:

- ◆ The number of website “hits” per year.
- ◆ The number of brochures printed and distributed/year.
- ◆ The number of requests for speakers or surveys taken, give-away requests, or for more information.
- ◆ The number of pet waste bags taken from dispensers each year.
- ◆ The number of attendees at various WES sponsored or project related events.
- ◆ Erosion control education and outreach activities implemented each year.

Fiscal analysis: This management strategy is currently funded, although additional resources may be needed in the future.

7.8 Pet Waste Management

TMDL parameters addressed: *E. coli*

Description of the potential sources: When pet waste is left in uncovered areas stormwater can transport *E. coli* from the land surface into the waters of the Willamette watershed.

Description of the Management Strategy: There are two main elements to the pet waste management strategy:

- ◆ *Public involvement and education:* Chapter 7.7, Public Involvement and Education, provides more information on this element.

- ◆ *Technical assistance and enforcement:* This management strategy is implemented when reports of improper pet waste management are submitted to Clackamas County’s DTD Community Environment Division (CED). The CED’s staff are the County’s solid waste management experts, and they can interface with complainants and pet owners to find solutions which prevent or greatly minimize the discharge of pet waste to the waterways.

Not all types of solid waste generated by animals are addressed by CED’s program (e.g., agricultural activities that generate manure). If reports of improper pet waste management in CCSD #1 UGB are submitted to WES, WES will respond as needed and appropriate to the situation substantively similar to CED’s. If reports of improper pet waste management in the City of Happy Valley are submitted to the City, the City or WES will respond as needed and appropriate to the situation substantively similar to CED’s.

Timeline for implementation: This management strategy is currently being implemented and is an ongoing activity.

Measurable milestones (if any): This management strategy will be evaluated annually for effectiveness and appropriate level of service. Adaptive management will be applied as appropriate to address limiting factors for watershed health. Assessment of this strategy will include performing qualitative assessments through interviews with staff and our customers and by tracking public education and outreach metrics such as:

- ◆ The number of website “hits” per year.
- ◆ The number of brochures printed and distributed per year.
- ◆ The number of pet waste bags taken from dispensers each year.

Fiscal analysis: This management strategy is currently funded.

7.9 Septic System Management

TMDL parameters addressed: *E. coli*.

Description of the potential sources: A potential source of bacteria in the waters regulated by the Willamette TMDL is failing septic systems. A septic system that is failing or has failed can discharge improperly treated or untreated wastewater into a surface water body. A properly functioning septic system discharges all of its wastewater into the earth’s uppermost, unsaturated soil layers after treatment; the water then percolates down into groundwater. In addition, setback requirements are administered for subsurface sewage disposal drainfields to minimize potential impacts to surface waters

Description of the Management Strategy: WES provides sanitary sewer service to properties currently within its CCSD#1 Service District boundary and properties that come into the CCSD#1 Boundary via annexation to the District itself or into a city which the District serves. The goal of this program is to make sanitary sewer services available to property owners within the annexed area. WES also administers the Onsite Sewage Treatment and Disposal (Onsite) Program as an agent of DEQ throughout Clackamas County. The goals of the program are to have no septic system failures and for all septic systems to be in a properly functioning condition. To achieve all of these goals, WES implements

- ◆ A process to address suspected failed or failing systems, and

- ◆ A process to educate the public about how to prevent septic system failures and how to report failures when they occur. This process is discussed in Chapter 7.7, Public Involvement and Education.

When septic systems fail in an area where sanitary sewer infrastructure is not within 300 feet of the property, a site visit is performed if the septic system has indeed failed and this is verified during the site visit, steps for needed correction are identified and a process for implementation is established. Time frames for repair are discussed with the property owners and the length of time allotted to repair is determined based on the severity of the problem. Discharges to the ground surface and into waterways are not allowed and are given the shortest time that is feasible for construction of repairs or implementation of alternatives. Alternatives vary from limiting the usage of the septic system (timing of laundry, for example) to vacating the premises until the problem is resolved. To address failing septic systems Clackamas County funds the Safety Net Program, which provides low interest loans for low income property owners to repair failing septic systems.

WES has an agreement with Clackamas County's DTD CED to bring violators into compliance if initial efforts are unsuccessful. All failing septic systems are an enforcement priority for CED. Initial efforts made by CED encourage voluntary compliance. In the event this is unsuccessful, CED has the ability to levy both fines and fees for code violations. A citation with forfeiture up to \$500 can be issued for a high priority violation. If a violation case is referred to the Compliance Hearings Officer, he/she can issue civil penalties up to \$3,500 on priority one violations. Additionally, all costs incurred by CED while administering the enforcement action, or a \$75 monthly administrative fee, can also be assessed.

If sanitary sewer infrastructure exists within 300 feet of the failing system, the property owner is required to 'hook-up' to the sanitary sewer network.

Timeline for implementation: This management strategy is currently being implemented and is an ongoing activity.

Measurable milestones (if any): This management strategy will be evaluated annually for effectiveness and appropriate level of service. Adaptive management will be applied as appropriate to address limiting factors for watershed health. Assessment of this strategy will include tracking the number of reports of failing septic systems, the outcome of inspections (failing or not), the date of follow-up that confirmed repairs were made, and the number of Safety Net loans provided. Assessments will also include tracking the number of septic systems that are eliminated by the provision of sanitary sewer and an analysis of the potential *E.coli* load reduction that can be realized by either repairing failed systems or eliminating these systems entirely.

Fiscal analysis: This management strategy is currently funded.

7.10 Illegal Dumping Management

TMDL parameters addressed: *E. coli*, DDT, dieldrin, and mercury

Description of the potential sources: Illegal dumping of solid waste can allow stormwater to move pollutants from the waste and into the waterways regulated by the Willamette Basin TMDL. Solid waste that may contain *E. coli* includes but is not limited to diapers and other waste containing fecal matter. Solid waste that may contain DDT and dieldrin includes unused quantities of these insecticides and

equipment or other items contaminated with residuals of these insecticides. Solid waste that may contain mercury includes but is not limited to fluorescent light bulbs, batteries, thermometers, and electronics.

Description of the Management Strategy: Illegal dumping of solid waste is addressed by three separate programs, each of which serves their own geographic area within the area that is regulated by the Willamette TMDL. Each program is described separately below:

- ◆ *Developed, unincorporated, primarily urban areas: County Ordinance:* Illegal dumping in developed, unincorporated, primarily urban areas is addressed by Clackamas County's Department of Transportation and Development's (DTD) Community Environment Division (CED). The CED administers a solid waste nuisance ordinance which pertains to illegal dumping on public and private property. This ordinance is administered on a priority-rated basis, and illegal dumping that involves household garbage is a high priority for enforcement and resolution. Mediation is an additional tool that CED uses to resolve certain types of solid waste issues that cause a condition of unsightliness on private property.
- ◆ *Rural areas: Clackamas County's Dump Stoppers Program:* Illegal dumping of solid waste in rural areas, including the edges of roadways in these areas, is addressed by Clackamas County's Dump Stoppers Program. County employees respond to reports of illegally dumped waste and coordinate the removal of the waste. Crews of people who have been ordered to perform community service remove the garbage and properly dispose of or recycle it. County employees install "no dumping" signs, with the program's hotline prominently displayed, in places where dumping has occurred. County employees aggressively sift through the trash in search of clues that can identify the persons who illegally dumped the waste. A Sheriff Deputy who is assigned to this program uses these clues to confirm identities of dumpers, and then tracks down, and if appropriate, cites those persons. The Clackamas County District Attorney's office has assigned a prosecutor to this program, and it pursues the most egregious cases.

As of March 21, 2007, 28 persons have been convicted by the Dump Stoppers program of illegal solid waste disposal since the program's creation in 2003. During this same time period, 225 cars, 4,398 tires, 24 tons of scrap metal, and 176 tons of other solid wastes have been removed from dump sites by the program.

This program's success is largely due to effective partnerships between several County departments, residents, schools, recreationalists, and large landowners in the watershed like the U.S. Forest Service, the Bureau of Land Management, and Longview Fibre Company.

- ◆ *City of Happy Valley: City Ordinance*
 - Illegal dumping of solid waste in the City of Happy Valley is regulated by the City. The City administers a solid waste nuisance ordinance which pertains to illegal dumping on public and private property. This ordinance is administered on a priority-rated basis, and illegal dumping that involves household garbage is a high priority for enforcement and resolution. Mediation is an additional tool that the City uses to resolve certain types of solid waste issues that cause a condition of unsightliness on private property.

In addition, Metro’s Household Hazardous Waste Facility near the intersection of Interstate-205 and Highway 213 in the City of Oregon City accepts unused amounts of hazardous and harmful wastes including insecticide products containing DDT and dieldrin as well as products that contain mercury for proper disposal. The Chapter 7.7, Public Involvement and Education, addresses how citizens are made aware of and directed to this facility, which prevents illegal disposal of solid waste.

Timeline for implementation: This management strategy is currently being implemented and is an ongoing activity.

Measurable milestones (if any): This management strategy will be evaluated annually for effectiveness and appropriate level of service. Adaptive management will be applied as appropriate to address limiting factors for watershed health.. Assessment of this strategy will include tracking waste removed through the Dump Stoppers Program, tracking the number of persons per year who complete the mediation process for solid waste dumping, and tracking the number of enforcement actions taken per year for solid waste dumping.

Fiscal analysis: This management strategy is currently funded.

7.11 Dead Animal Management

TMDL parameters addressed: *E. coli*.

Description of the potential sources: Warm-blooded animals carry *E. coli* in their gastrointestinal tract. Stormwater runoff could carry *E. coli* from a dead, warm-blooded animal’s (deer, for example) gastrointestinal tract into surface water bodies if its carcass was laying on or adjacent to a roadway or drainageway.

Description of the Management Strategy: The City of Happy Valley and Clackamas County’s Road Department’s Management Strategies are as follows:

- ◆ Large, dead animals on County roads with “full County maintenance” are removed and properly disposed of by Clackamas County’s Road Department. Clackamas County’s Road Department recently submitted an ESA 4(d) limit submittal for Routine Road Maintenance to NOAA Fisheries and began the process of adhering to ODOT’s *Routine Road Maintenance, Water Quality and Habitat Guide, Best Management Practices*, Revised 2004 (ODOT Guide). Removal of dead animals from the road is addressed under “Accident Cleanup (Activity 149)” on page #32 of the ODOT Guide.
- ◆ Large, dead animals on City streets in the City of Happy Valley are collected, triple-bagged, and taken to Metro’s South Transfer station in Oregon City by the City’s Public Works Maintenance Department (PWMD). Any additional cleanup that is appropriate is also performed by PWMD staff.

Timeline for implementation: This management strategy is currently being implemented and is an ongoing activity.

Measurable milestones (if any): This management strategy will be evaluated annually for effectiveness and appropriate level of service. Adaptive management will be applied as appropriate to address li-

miting factors for watershed health. Assessment of this strategy will include tracking the number of dead animal removals performed annually.

Fiscal analysis: This management strategy is currently funded.

7.12 Spill Response and Illicit Discharge Elimination Programs

TMDL parameters addressed: *E. coli*, DDT, dieldrin, mercury

Description of the potential sources: The spill or illicit discharge of certain substances containing TMDL parameters such as *E. coli*, DDT, dieldrin, and mercury can cause watershed health impairment.

Potential sources of *E. coli* include untreated sewage releases from a privately owned sanitary sewer line due to pipe failures or improper connections.

If unused quantities of DDT or dieldrin are spilled or illicitly discharged, these insecticides could flow directly (or indirectly via stormwater) into the waters of Johnson Creek. Spills and illicit discharges of DDT and dieldrin are unlikely given that their use has been banned for many years.

If liquid or sludge-like materials that contain mercury are spilled or illicitly discharged, mercury could flow directly (or indirectly via stormwater) into a creek that discharges to or is a tributary of the Willamette River.

Description of the Management Strategy: Spill response and illicit discharge detection and elimination (IDDE) programs are addressed by several management strategies depending on location. Clackamas County's Road Department's, the City of Happy Valley's, and WES' Management Strategies are as follows:

- ◆ *Clackamas County Roads:* If materials that potentially contain harmful substances (such as TMDL parameters including *E. coli*, DDT, dieldrin or mercury) are spilled or illicitly discharged onto a Clackamas County road's right-of-way in non-MS4-permitted areas and the impacted road segment is eligible for "full County maintenance", personnel from Clackamas County's Road Department will respond if they discover the incident or if they are notified about the incident and it is determined that a response is appropriate.

Road Department crews will ensure that the release of the material is halted and that the material is subsequently cleaned up in a manner that prevents harmful substances from entering waters, if possible, or minimizes the amount of harmful substances that enters waterways if that is not possible. If a response by a government agency is required for a spill involving agricultural materials that contain TMDL parameters (i.e., *E. coli* from animal manure), ODA will provide oversight for the incident, in coordination with the Road Department. As was noted previously, the Clackamas County Road Department adheres to the ODOT Guide. Roadway spill response work is addressed in these two sections of this document: "Accident Cleanup" (Activity 149) on page 32 and "Spill Prevention and Cleanup" on page 15 of the ODOT Guide.

- ◆ *CCSD #1's UGB subunit (including the City of Happy Valley):* Spill response and illicit discharge elimination program services are provided by WES in CCSD #1's UGB subunit, which in-

cludes the City of Happy Valley. Instances involving spills and illicit discharges on County and City-owned roadways in CCSD #1 UGB are regulated by the MS4 permit and are not addressed in this Implementation Plan.

The spill response and illicit discharge elimination work performed in CCSD #1 UGB by WES that is described in this portion of the Implementation Plan is limited to spills and illicit discharges that: 1) pass through privately owned storm sewer outfalls, 2) move by over-land sheet flow on private property, and 3) move through privately owned ditches.

WES staff makes reasonable efforts during business hours to try to halt the release of spilled and illicitly discharged material and to get the responsible party to clean up their material. The goal is to prevent or to minimize the release of TMDL parameters and other potentially harmful substances into waterways. If efforts by WES staff fail to halt the release of the material and the material contains TMDL parameters that are likely to enter waters, WES staff will contact the DEQ and request their support. DEQ has the authority to compel most dischargers in urban areas to halt or modify their discharge if the material contains a significant amount and is likely to flow directly to Waters of the State.

- ◆ *Other geographic areas:* If WES staff are made aware of non-septic system related material containing TMDL parameters that is spilled or illicitly discharged in the following areas, WES staff will contact DEQ and refer the case to them:
 - Unincorporated, non-ODA/ODF areas regulated by the Willamette *E. coli* TMDL in Clackamas County
 - Areas that are state or federal lands
 - Clackamas County roads without “full County maintenance”

DEQ has the authority to do the applicable source control work on these lands and, if need be, can compel most responsible parties to halt or modify their discharge if spilled or illicitly discharged material contains a significant concentration of TMDL parameters and is likely to flow directly to Waters of the State.

Timeline for implementation: This management strategy is currently being implemented and is an ongoing activity.

Measurable milestones (if any): This management strategy will be evaluated annually for effectiveness and appropriate level of service. Adaptive management will be applied as appropriate to address limiting factors for watershed health.. Assessment of this strategy will include tracking the number of illicit discharges and spills per year.

Fiscal analysis: This management strategy is currently funded.

7.13 Riparian Assessment and Management

TMDL parameters addressed: Temperature

Description of the potential sources: Removal or disturbance of riparian vegetation reduces stream shading, exposing streams to higher levels of solar radiation. Solar radiation (sunlight) falling directly on streams can cause water temperature to increase. Alteration of the riparian canopy can also change the microclimate near streams, increasing air flow and heat exchange with the stream and thereby elevating water temperatures.

Description of the Management Strategy: Protection and restoration of system potential vegetation and effective shade in riparian areas are the primary mechanisms for achieving load allocations for temperature.

Clackamas County will assess riparian shade in both the CCSD#1 Service District and the SWMACC Service district where revenue is collected for surfacewater management. The County will conduct both on- the-ground surveys and a GIS analysis of canopy cover as part of the Watershed Action Planning (WAP) process in these areas..

Clackamas County plans to update Biological Surveys (previous studies conducted in 2002-2003) to include Benthic Macroinvertebrates and Habitat/Riparian Inventories. Through an intergovernmental agreement with the Oregon Department of Fish and Wildlife (ODFW), the County will be provided with updated biological surveys for up to 18 river miles within CCSD #1 and up to 9 river miles within SWMACC. Final stream reaches that are selected for updated surveys will begin in March 2008 and be based in part on priority reaches and landowner access. The Biological Surveys will generally include:

- ◆ Fish abundance and distribution
- ◆ Habitat and riparian shade assessments
- ◆ Canopy density measurements
- ◆ Continuous summer temperature monitoring during June through September

The results of the updated Biological Surveys will be incorporated into final reports, a Watershed Health Index and Report Card, and the WAPs.

The WAPs will include a GIS-based riparian tree canopy assessment in order to prioritize stream reaches for riparian protection and/or enhancement. ODFW survey results will be incorporated into the prioritization criteria. Clackamas County will then focus its riparian enhancement/protection activities within these high priority stream reaches. Strategies will include:-Tax or other landowner incentives for providing easements and establishing riparian vegetation. Land acquisition and/or transfer of development rightsRiparian plantings and maintenance agreementsPartnerships with non-profit watershed restoration groups and watershed councils.

Timeline for implementation: The updated Biological Surveys will be completed by December 2009. The WAPs were completed July 2009. Implementation of the WAP recommended management strategies (including riparian enhancement/protection) will begin in FY 2009-10.-

Measurable milestones (if any): This management strategy will be evaluated annually for effectiveness and appropriate level of service. Adaptive management will be applied as appropriate to address li-

miting factors for watershed health. Implementation of this strategy will include identifying and prioritizing riparian areas for restoration or protection actions; and working with landowners directly and via partnerships to develop on-the-ground projects to enhance/protect riparian areas. These activities will be tracked both spatial (via GIS) and in a database to determine the effectiveness of these strategies.

Fiscal analysis: Clackamas County has budgeted \$100,000 in FY 07-09 to fund the updated Biological Surveys including benthic macroinvertebrates, fish populations, and habitat. Approximately \$350,000 was budgeted for the FY 09-10 for riparian protection/enhancement projects. Future budgeting will depend on available funding.

An example of the implementation strategies is the partnership formed between the North Clackamas Parks and Recreation District and the Johnson Creek Watershed Council, SOLV, the Overland Neighborhood association and other businesses and individual volunteers to work on a 5 mile section of Johnson creek. Objectives are as follows for in-stream and riparian habitat; trash clean up and education on trash disposal, control non-native plants and education on native plant restoration, field education and implementation of buffer restoration. First annual event 2008.

Clackamas County Parks has a part time employee who concentrates on a tree planting program. County Parks plants thousands of plants annually, improving upland and riparian habitats

In addition to the biological surveys, ecosystem surveys will be initiated at all County and NCPRD Parks. Surveys will include habitat and riparian inventory data including canopy density measurements, riparian shade assessment and additional habitat variables.

- Biological survey data collected by WES and ODFW 2008 will be used as a preliminary assessment of data collection priorities and gaps.
- Additional data collection will partially be completed through an Parks Ecosystem Assessment through Clackamas County Parks and NCPRD partially funded through the work performed by our Northwest Service Academy AmeriCorps member.

Survey data will be used to determine habitat conditions and result in management recommendations and priorities (e.g. enhancement of riparian buffers). Partnerships with other agencies, non-profits, citizen groups (e.g. Friends Groups), and volunteers will cooperate in review and prioritization process.

Management recommendations and priorities will be used to guide planning and implementation efforts. Partnerships with other agencies, non-profits, citizen groups and volunteers will cooperate in planning review and implementation process. This portion of the process is not fully funded

7.14 CWR Assessment and Management

TMDL parameters addressed: Temperature and CWR

Description of the potential sources: CWR are areas within rivers that maintain cooler temperatures in summer when water temperature elsewhere in the river increases. CWR offer migrating salmonids, other native fish, and aquatic species relief from the warmer river temperatures found in the summer months. Alteration to river channel structure including removal or lack of large woody debris and modifications to deep pools and overhanging bank areas can reduce the presence of CWR. Reduc-

tions in infiltration of stormwater from developments and resultant groundwater inputs and increasing temperatures of tributary stream inputs can also reduce the presence of CWR.

Description of the Management Strategy: Clackamas County plans to participate in a joint effort with other DMAs to identify existing CWR along the mainstem Willamette River and provide options for protecting or enhancing such areas. The Association of Clean Water Agencies (ACWA) may play a role in managing this coordinated process.

Timeline for implementation: This management strategy will be implemented by June 2012.

Measurable milestones (if any): This management strategy will be evaluated annually for effectiveness and appropriate level of service. Adaptive management will be applied as appropriate to address limiting factors for watershed health.. Milestones for this strategy will include completion of a report, most likely from a consultant, which identifies CWR and provides options for enhancement and protection of CWR, if appropriate.

Fiscal analysis: This management strategy will require additional funding that has not yet been budgeted.

SECTION C

IMPLEMENTATION

8. *E. coli*

8.1 Matrix of Management Strategies

Table 4 lists strategies for reduction and management of *E. coli* (bacteria).

8.2 Barriers to Implementation

This Implementation Plan addresses *E. coli* that are discharged by the following types of conveyance systems from lands under Clackamas County jurisdiction for the TMDL implementation (i.e., land not owned by the state or federal government, and land not in Oregon Department of Agriculture (ODA)/Oregon Department of Forestry (ODF) regulated areas):

- Clackamas County and County Service District-owned (in Boring, for example) storm sewer outfalls that are not subject to the MS4 permit's requirements.
- Privately owned storm sewer outfalls.
- Overland sheet flow or channelized flows that do not flow through MS4-permitted or privately owned storm sewer outfalls.

Clackamas County's, CCSD #1's, and the City of Happy Valley's authority to control sources of bacteria in privately owned conveyance systems is usually quite limited. If Clackamas County, Water Environment Services (WES), and/or the City of Happy Valley is aware of a privately owned conveyance system that is a significant, known source of *E. coli*, the matter will be referred to the Oregon Department of Environmental Quality (DEQ) if public education and/or mediation fail to yield the necessary water quality improvement.

The sources of in-stream *E. coli* loading are generally not well defined, and in most instances are likely to include significant contributions from the feces of wild birds and mammals. Clackamas County, CCSD #1, the City of Happy Valley, and WES cannot and do not accept sole responsibility for reducing *E. coli* loading in any of the Willamette basin water bodies.

Clackamas County, CCSD #1, the City of Happy Valley, and WES do accept some of the responsibility for reducing the fraction of the *E. coli* loading:

- Which originates on those lands which Clackamas County, CCSD #1, the City of Happy Valley and WES have the authority to regulate, and
- Which is generated by the specific land uses that Clackamas County, CCSD #1, the City of Happy Valley and WES have the authority to regulate, but
- Only if the *E. coli* loading is not from the feces of wild birds and mammals.

Table 4. Management Strategies Matrix for Bacteria

Source	Strategy	How and Implementer(s)	Fiscal analysis	Measure	Timeline	Milestone
<i>What sources of this pollutant are under your jurisdiction?</i>	<i>What is being done, or what will you do, to reduce and/or control pollution from this source?*</i>	<i>How will this be done and by which jurisdiction(s)?*</i>	<i>What is the expected resource need?*</i>	<i>How will we demonstrate successful implementation or completion of this strategy?*</i>	<i>When do you expect it to be completed?*</i>	<i>What goals do you expect to achieve, and by when, to know progress is being made?*</i>
1. Stormwater runoff	a. Implement Watershed Action Plans (WAPs)	WAP recommended updates and revisions to the existing stormwater design standards to emphasize low impact development techniques. These design standard revisions will be implemented by CCSD#1 in March of 2011. The emphasis on green infrastructure and infiltration mitigate stormwater runoff which may contain <i>E.coli</i> <i>Retrofit existing underperforming detention facilities to enhance water quality treatment. (WES, Clackamas County & Happy Valley)</i>	\$700,000 budgeted in FY 010-15. .	Number of developments utilizing low-impact development standards and associated BMP contributing areas..	March 2011	By 2010, WAP developed. By 2011 implementation of WAP projects started. After 2011, progress will be evaluated for effectiveness and level of service.
	b. Stormwater regulations	Revise and implement design/construction standards for post-construction phase stormwater management of new/redevelopment. <i>(WES, Clackamas County & Happy Valley)</i>	Currently funded	Track permit applications for new/redevelopment and stormwater management measures implemented.	Ongoing; revision to design/construction standards will follow the development of the WAPs.	Evaluate measures annually for effectiveness and level of service; apply adaptive management.
	c. Industrial/ Commercial Stormwater Program	Implement the WES "Non-Single-Family Residential Maintenance Agreement Program" (NSFRMAP) The NSFRMAP agreements obligate property owners to clean and maintain their storm sewer system. <i>(WES)</i>	0.1 FTE required for NSFRMAP (budgeted for FY08)	Track annual letters sent to property owners in NSFRMAP identifying their requirements; track annual reports received from NSFRMAP property owners.	First annual letters sent by June 2009, ongoing work following	Annual letters sent beginning 2009; receive annual reports from owners. Evaluate measures annually for effectiveness and level of service; apply adaptive management.
	d. Water quality monitoring	Conduct stormwater and in-stream water quality monitoring. <i>(WES)</i>	Existing monitoring levels currently funded.	Review monitoring results annually and evaluate effectiveness of management strategies.	Ongoing.	Evaluate measures annually for effectiveness and level of service; apply adaptive management.
2. Failing septic systems	a. Connect to Sanitary Sewer	Provide sanitary sewer service to properties currently within its CCSD#1 Service District boundary and properties that come into the CCSD#1 Boundary via annexation to the District itself or into a city which the District serves.	Current annexations funded	Track number of connections and estimate pollutant load reduction.	Ongoing	Evaluate measures annually for effectiveness and level of service; apply adaptive management.
	b. Septic system management	Respond to reports of failing systems; work with homeowner to set a timeline for repair. County-funded Safety Net Program provides low interest loans for low income property owners to repair failing septic systems. <i>(WES & Clackamas County)</i>	Currently funded	Track number of Failures that need repair permits, number of Failures that need maintenance, number of enforcement actions, and # of Safety Net loans provided.	Ongoing	Evaluate measures annually for effectiveness and level of service; apply adaptive management.

Table 4. Management Strategies Matrix for Bacteria						
	c. Public involvement and education	Provide information in brochures, on WES' website, and upon request about septic system maintenance and how to detect failures. <i>(WES & Clackamas County)</i>	Currently funded	Track the number of website "hits" and the number of brochures printed/year	Ongoing	Evaluate measures annually for effectiveness and level of service; apply adaptive management.
3. Pet waste	a. Pet waste management and Public involvement and education	Public education to pet owners through a variety of sources. Maintain educational signs and provide dog waste bag dispensers in parks. <i>(WES, Clackamas County & Happy Valley)</i>	Currently funded	Track number of bags taken from dispensers each year. Track the number of website "hits"	Ongoing	Evaluate measures annually for effectiveness and level of service; apply adaptive management
4. Dead animals	a. Dead animal management	Personnel from Clackamas County Road Dept. and from Happy Valley's Public Works Maintenance Dept. collect and properly dispose of large dead animals on full-service roads. <i>(Clackamas County & Happy Valley)</i>	Currently funded	Track the number of removals performed annually.	Ongoing	Evaluate measures annually for effectiveness and level of service; apply adaptive management
5. Illegal dumping of solid waste	a. Illegal dumping management and public education and involvement	Implement Clackamas County's Dump Stoppers Program and City of Happy Valley illegal dumping ordinance. Provide public education related to illegal dumping, including publicizing Metro hazardous waste facilities. <i>(Clackamas County & Happy Valley)</i>	Currently funded	Track waste removed through Dump Stoppers Program. Track number of persons/year who complete mediation process for solid waste dumping. Track number of enforcement actions taken/year for solid waste dumping.	Ongoing	Evaluate measures annually for effectiveness and level of service; apply adaptive management
6. Illicit discharges and spills	a. Spill response and IDDE	Implement spill response and IDDE program on Clackamas County full service roads and within CCSD#1's UGB subunit. Refer other cases to DEQ. <i>(WES & Clackamas County)</i>	Currently funded	Track the number of discharges/spills per year.	Ongoing	Evaluate measures annually for effectiveness and level of service; apply adaptive management

* Note: Details on management strategies are provided in Chapter 7. Fiscal analysis primarily applies to Clackamas Co. and CCSD#1. City of Happy Valley management strategies may require further fiscal analysis.

Land ownership categories that are potential sources of in-stream *E. coli* loading which Clackamas County, CCSD #1, the City of Happy Valley and WES have very little or no authority to regulate or control include, but are not limited to:

- Privately owned timberlands
- Privately owned farm, ranch, and orchard lands
- BLM and Forest Service lands (U.S. government)
- Nearly all lands within the other cities in the TMDL’s geographic area
- Highways and other State-owned lands

The bacteria load allocation may be exceedingly difficult and prohibitively expensive to attain in many of those water bodies where more than 22 percent of the in-stream *E. coli* loading is from the feces of wild birds and mammals.

It is Clackamas County and the City of Happy Valley’s understanding that we are legally responsible only for preventing and/or controlling the portion of the *E. coli* load that originated in the gut of humans or in fecal material from pets—and then only if we have the authority to regulate the activity which caused the pollution—but not from other host species, including livestock, wild mammals, and wild birds.

8.3 Implementation Monitoring, Annual Status Reports, and Evaluation Reports

According to OAR 340-042-0080(3)(a)(C), Clackamas County and CCSD #1 shall “Provide for performance monitoring...”. The definition of performance monitoring, as provided in OAR 340-042-0030(7) is “...monitoring implementation of management strategies, including sector-specific and source-specific implementation plans, and resulting water quality changes.” The two types of performance monitoring that are required, “implementation” and “effectiveness” monitoring, are addressed.

Implementation monitoring will be conducted by the City of Happy Valley and by Clackamas County’s Departments of Transportation and Development, Business and Community Services, and/or WES to confirm that specific Management Strategies that are outlined in this Implementation Plan were actually implemented. A summary of the work that was done to implement the Management Strategies will be submitted to DEQ in Annual Status Reports, as is required by the TMDL’s “Water Quality Management Plan” (see page 11 in chapter 14). Every fifth year, an Evaluation Report will also need to be submitted. For more information on Evaluation Report requirements, also see page 11 of the Water Quality Management Plan.

8.4 Effectiveness Monitoring

Effectiveness monitoring is conducted to determine if our Management Strategies are effectively reducing in-stream pollutant loading from sources that Clackamas County, WES, the City of Happy Valley, and/or CCSD #1 are partially or completely responsible for. The resulting data will then, from time to time, be compared to:

- The *E. coli* LA to determine if the allocation has been attained, and/or
- Current *E. coli* water quality standards/criteria and to historic data to determine if in-stream water quality has improved to the desired level or by the desired percentage.

Each year in CCSD #1 UGB, WES currently performs a significant amount of *E. coli* monitoring: a) at several County-owned storm sewer outfalls during storms, and b) in several creeks in both dry weather and during storms. Although this monitoring work is performed largely in response to MS4 permit requirements, the in-stream monitoring that is being conducted in the period from July 1, 2007 to June 30, 2008 will be very useful for assessing the current and future degree of CCSD #1 UGB's in-stream *E. coli* contamination. The City of Happy Valley and CCSD #1 believe that the current monitoring locations and frequency provide sufficient coverage of discharges from private storm sewer system CCSD #1 UGB and no changes to the current, DEQ-approved *E. coli* monitoring locations or frequency are being proposed at this time under this Implementation Plan.

In-stream *E. coli* monitoring in the portion of the watershed that is regulated by the Willamette *E. coli* TMDL that is in or very near Clackamas County but not within CCSD #1 UGB is currently performed on an ongoing basis by many other clean water partners, including but not limited to, the DEQ (the Clackamas and Willamette Rivers), the City of Portland (Johnson and Tryon Creeks and the Willamette River), the City of Oregon City (Abernethy and Singer Creeks), and the City of West Linn (Tanner and Trillium Creeks). We believe that the in-stream *E. coli* monitoring described here—performed on an ongoing basis by WES in CCSD #1 UGB and by various partners outside of CCSD #1 UGB—provides adequate coverage of the portion of the watershed that is regulated by the Willamette *E. coli* TMDL in Clackamas County.

8.5 Timeline

The goal of Clackamas County, WES, and Happy Valley is to attain the load allocations for each TMDL parameter through an adaptive management process. Clackamas County is committed to investing in activities and programs that contribute to overall watershed health. Clackamas County is currently implementing a variety of management strategies to improve and maintain water quality, as described in Chapter 7, and tracking the effectiveness of these activities with monitoring as described in Chapter 8.4. It is unknown at this time whether the current and planned level of management activities will provide enough pollutant load reduction to meet the load allocation given the barriers to implementation described in Chapter 8.2. As monitoring demonstrates progress toward pollutant reduction, Clackamas County will adaptively manage its activities and programs in order to work toward attaining the load allocations.

It is expected to take longer to attain the load allocations in areas where a larger share of the in-stream *E. coli* loading is from the feces of wild birds and mammals. The load allocation may be exceedingly difficult and prohibitively expensive to attain in many of those water bodies where more than 22 percent of the in-stream *E. coli* loading is from the feces of wild birds and mammals.

Attaining the load allocation for *E. coli* in the Willamette TMDL watershed will likely require action by a variety of government agencies and private landowners. Clackamas County, WES, and Happy Valley's work toward reducing *E. coli* in surface water will likely be complemented by actions taken by the following three government agencies that provide additional regulatory authority and/or education and technical assistance:

- The Clackamas County Soil & Water Conservation District
- ODA
- ODF

9. DDT and Dieldrin in the Johnson Creek Watershed

9.1 Matrix of Management Strategies

Table 5 lists strategies for reduction and management of DDT and dieldrin in the Johnson Creek Watershed.

9.2 Barriers to Implementation

The DDT and dieldrin TMDL is limited to the Johnson Creek watershed. This watershed drains a small portion of Clackamas County in the area in and near the Cities of Milwaukie, Happy Valley, and Damascus. Less than 3 percent of the entire Johnson Creek watershed (less than 1,000 acres out of a total watershed area of about 55 square miles) lies within CCSD #1 and/or the City of Happy Valley. Additional acreage in Clackamas County's portion of the watershed lies within the City of Damascus and in the rural area upstream from Damascus.

The Johnson Creek watershed consists of a patchwork of land uses/owners, draining a large rural area, portions of five cities (Gresham, Portland, Happy Valley, Milwaukie and Damascus), some urbanized unincorporated lands, and portions of two counties. Numerous agencies provide jurisdiction over certain activities which may cause in-stream DDT contamination. However, many soil-disturbing activities, such as gardening and off-road vehicle use, are not regulated by any agency.

During wet weather, the bulk of the DDT and dieldrin loading appears to be coming from land that Clackamas County, WES, and Happy Valley do not regulate. Much of this appears to be washing off of the rural, largely ODA/ODF-regulated areas upstream of the City of Gresham. For evidence which supports this statement, please see figure 5.128 in the TMDL document, the July 2005 IJC fact sheet, and/or the November 15, 2006 Technical Memorandum titled *Johnson Creek Pesticide Investigation - Continuous Turbidity Measurements* (Prepared by the Johnson Creek Watershed Council in consultation with the IJC/Project Number: WO4558/DEQ Contract Number: 025-05).

For these reasons, Clackamas County, CCSD #1, the City of Happy Valley, and WES cannot and do not accept sole responsibility for reducing in-stream DDT loads from non-point sources in Clackamas County. Clackamas County, CCSD #1, the City of Happy Valley, and WES do accept some of the responsibility for reducing the fraction of the DDT loading:

- Which originates on those lands which Clackamas County, CCSD #1, the City of Happy Valley, and WES have the authority to regulate, and
- Which is generated by the specific land uses that Clackamas County, CCSD #1, the City of Happy Valley, and WES have the authority to regulate.

Land ownership categories that are potential sources of in-stream DDT loading via non-point sources which Clackamas County, CCSD #1, the City of Happy Valley and WES have very little or no authority to regulate or control include, but are not limited to:

- Privately owned timberlands
- Privately owned farm, ranch, nursery, and orchard lands
- U.S. government-owned lands
- Nearly all lands within the other four cities
- Highways and other State-owned lands

9.3 Implementation Monitoring, Annual Status Reports, and Evaluation Reports

Implementation monitoring will be conducted by Clackamas County's Departments of Transportation and Development, Business and Community Services, and/or WES and the City of Happy Valley to confirm that specific Management Strategies that are outlined in this Implementation Plan were actually implemented. A summary of the work that was done to implement the Management Strategies will be submitted to DEQ in Annual Status Reports, as is required by the TMDL's "Water Quality Management Plan" (see page 11 of the WQMP). Every fifth year, an Evaluation Report will also need to be submitted. For more information on Evaluation Report requirements, also see page 11 of the WQMP.

Table 5. Management Strategies Matrix for DDT and dieldrin

Source	Strategy	How and Implementer(s)	Fiscal analysis	Measure	Timeline	Milestone
<i>What sources of this pollutant are under your jurisdiction?</i>	<i>What is being done, or what will you do, to reduce and/or control pollution from this source?*</i>	<i>How will this be done and by which jurisdiction(s)?*</i>	<i>What is the expected resource need?*</i>	<i>How will we demonstrate successful implementation or completion of this strategy?*</i>	<i>When do you expect it to be completed?*</i>	<i>What goals do you expect to achieve, and by when, to know progress is being made?*</i>
1. Stormwater runoff	a. Watershed Action Plan (WAP)	Watershed health improvements are addressed through the existing Johnson Creek WAP and the Johnson Creek Watershed Council. Clackamas County provides financial support to the Johnson Creek Watershed Council and fills a Council seat as a one of the Jurisdictional Representatives. As a member of the Council, Clackamas County participated in the development of the original WAP and is participating in the revisions to the WAP. Clackamas County also participates in the Johnson Creek Interjurisdictional Committee. (WES, Clackamas County & Happy Valley)	Currently funded	WAP will be used to prioritize stormwater management activities, develop capital projects and programmatic measures to improve watershed health.	Ongoing	Progress will be evaluated for effectiveness and level of service.
	b. Stormwater regulations	Revise and implement design/construction standards for post-construction phase stormwater management of new/redevelopment. (WES, Clackamas County & Happy Valley)	Currently funded	Track permit applications for new/redevelopment and stormwater management measures implemented.	Ongoing. The revision to design/ construction standards will follow the development of the WAPs.	Evaluate measures annually for effectiveness and level of service; apply adaptive management.
	c. Industrial/ Commercial Stormwater Program	Implement the WES "Non-Single-Family Residential Maintenance Agreement Program" (NSFRMAP) The NSFRMAP agreements obligate property owners to clean and maintain their storm sewer system. (WES)	0.1 FTE required for NSFRMAP (budgeted for FY08)	Track annual letters sent to property owners in NSFRMAP identifying their requirements; track annual reports received from NSFRMAP property owners.	Annual letters sent by June 2009, ongoing work following	<ul style="list-style-type: none"> Annual letters sent beginning 2009; receive annual reports from owners. Evaluate measures annually for effectiveness and level of service; apply adaptive management.

Table 5. Management Strategies Matrix for DDT and dieldrin

	d. Water quality monitoring	Conduct stormwater and in-stream water quality monitoring. WES provides funds for multi-jurisdictional funding of USGS monitoring of targeted pollutants and flow in the watershed. <i>(WES)</i>	Existing monitoring levels currently funded	Review monitoring results annually and evaluate effectiveness of management strategies.	Ongoing	Evaluate measures annually for effectiveness and level of service; apply adaptive management.
2. Illegal dumping of solid waste	a. Illegal dumping management and public education and involvement	Implement Clackamas County's Dump Stoppers Program and City of Happy Valley illegal dumping ordinance. Provide public education related to illegal dumping, including publicizing Metro hazardous waste facilities. <i>(Clackamas County & Happy Valley)</i>	Currently funded	<ul style="list-style-type: none"> Track waste removed through Dump Stoppers Program. Track # of persons/year who complete mediation process for solid waste dumping. Track # of enforcement actions taken/year for solid waste dumping. 	Ongoing	Evaluate measures annually for effectiveness and level of service; apply adaptive management.
3. Illicit discharges and spills	a. Spill response and IDDE	Implement spill response and IDDE program on Clackamas County full service roads and within CCSD #1's UGB subunit. Refer other cases to DEQ. <i>(WES & Clackamas County)</i>	Currently funded	Track the number of discharges/spills per year.	Ongoing	Evaluate measures annually for effectiveness and level of service; apply adaptive management.
4. Runoff and soil erosion from construction sites	a. Erosion control programs and public and education and involvement	Implement erosion control programs in CCSD #1, SWMACC, Happy Valley, and Clackamas County DTD service areas. Require erosion control permits as applicable; provide technical assistance, education, and outreach as applicable. Implement road maintenance practices on Clackamas County full maintenance roads according to ODOT BMP manual for water quality and habitat. <i>(WES, Clackamas County & Happy Valley)</i>	Currently funded for CCSD #1, SMWACC, and Happy Valley; additional resources may be needed. Additional resources are needed to fully implement in DTD service area.	Track erosion control permits issued; inspections performed; enforcement actions taken; and education and outreach activities implemented.	Ongoing	Evaluate measures annually for effectiveness and level of service; apply adaptive management.

* Note: Details on management strategies are provided in Chapter 7. Fiscal analysis primarily applies to Clackamas Co. and CCSD#1. City of Happy Valley management strategies may require further fiscal analysis.

9.4 Effectiveness Monitoring

Effectiveness monitoring is conducted to determine if our Management Strategies are effectively reducing in-stream pollutant loading from sources that Clackamas County, WES, the City of Happy Valley, and/or CCSD #1 are completely or partially responsible for. The resulting data will then, from time to time, be compared to:

- The DDT LA (94 percent reduction) or the TSS target (15 mg/L) to determine if the allocation has been attained, and/or
- Current DDT and dieldrin water quality standards/criteria and to historic data to determine if in-stream water quality has improved to the desired level.

Each year in CCSD #1 UGB, WES currently performs a significant amount of monitoring of TSS levels: a) at several County-owned storm sewer outfalls during storms, and b) in several creeks in both dry weather and during storms, though none of these locations are in the Johnson Creek watershed. The surface/stormwater monitoring plan being followed in fiscal year 2007-2008 (and quite possibly in future fiscal years) is being implemented jointly with numerous partners, including the City of Milwaukie, and the single monitored storm outfall in the City discharges to Johnson Creek.

In addition, given that only small portion of CCSD #1 UGB flows into Johnson Creek, WES elected to continue having CCSD #1 participate in inter-jurisdictional water quality and flow monitoring efforts to yield high-quality data in a coordinated, cost-effective manner in fiscal year 2007-2008. WES expects to continue to have CCSD #1 participate in this effort in future fiscal years. Under this effort, funds that might otherwise have been spent inefficiently under a separate data collection effort were instead pooled with funds from Multnomah County, the Cities of Portland, Gresham and Milwaukie, and the federal government. Recent, coordinated monitoring projects include:

- Turbidity, total suspended solids (TSS), and pesticide measurements in the waters of Johnson Creek: CCSD #1—in partnership with the cities of Gresham, Happy Valley, Milwaukie, and Portland, the Johnson Creek Watershed Council, and Multnomah County—provided in-kind contributions (i.e., labor) towards a study that explored the relationship between DDT, TSS, and dieldrin. Section 319 grant funds from DEQ supported a portion of this study. Creek water samples were analyzed in an effort to determine which levels of TSS and turbidity can be expected to correlate with certain levels of these pesticides. On November 13, 2006, the study's final report, titled *Johnson Creek Pesticide Investigation—Continuous Turbidity Measurements, Technical Memorandum* was published. This study found that a statistically significant correlation exists between both TSS and turbidity, and DDT.
- U.S. Geological Survey's (USGS) Continuous Monitoring Stations in the Johnson Creek Watershed: CCSD #1—in partnership with the cities of Gresham, Happy Valley, Milwaukie, Portland, Multnomah County, and USGS—contributed funds towards the operation of five continuous surface water quality and flow monitoring stations in the Johnson Creek watershed in fiscal year 2007-2008. This was the 8th year in a row that funds were contributed by CCSD #1 for this work. These stations collect data 24 hours/day, 7 days/week. In 2007-2008, data was collected at all stations for the following parameters: water temperature and water flow. In addition, turbidity data was collected at two stations, including the one in the City of Milwaukie near CCSD #1, during this time period.

Data from these USGS stations can be viewed on this USGS webpage:
<http://waterdata.usgs.gov/or/nwis/current/?type=quality>.

In-stream monitoring in the portion of the Johnson Creek watershed that is not within CCSD #1 UGB is currently performed on an ongoing basis by many other clean water partners, including but not limited to, the USGS and the cities of Portland and Gresham. For example, one of the USGS' five previously mentioned continuous surface water quality and flow monitoring stations is in the Southeastern portion of the City of Gresham (at Regner Road). Most of the watershed above this point is rural, and about half of that area is in Clackamas County. Turbidity and flow data is collected by this station, offering useful data on estimated in-stream DDT and dieldrin concentrations and loads.

9.5 Timeline

The goal of Clackamas County, WES, and Happy Valley is to attain the load allocations for each TMDL parameter through an adaptive management process. Clackamas County is committed to investing in activities and programs that contribute to overall watershed health. Clackamas County is currently implementing a variety of management strategies to improve and maintain water quality, as described in Chapter 7, and tracking the effectiveness of these activities with monitoring as described in Chapter 9.4. It is unknown at this time whether the current and planned level of management activities will provide enough pollutant load reduction to meet the load allocation given the barriers to implementation described in Chapter 9.2. As monitoring demonstrates progress toward pollutant reduction, Clackamas County will adaptively manage its activities and programs in order to work toward attaining the load allocations.

The latest observed rates of in-stream “total DDT” – the sum of DDT and certain breakdown products – and dieldrin are falling if recent data is compared to data collected in 1989-1990, in 1992 (streambed sediments only), and in 1994. Data collected during a storm in March 2002, between October 2003 to June 2004, and between July 2005 to April 2006 is the most recent which is available. The significant, steady decrease that has been documented is due to many factors, discontinuation of use most importantly, but also because some of the DDT and dieldrin molecules continue to break down into harmless or less harmful byproducts, and because much of the DDT and aldrin/dieldrin that had been legally applied decades ago has been washed away from the watershed's upland, riparian, and in-stream areas and into the Willamette River.

The attainment of the TMDL Load Allocation will likely be due to a loose or structured partnership with the cities and the landowners mentioned above, and in combination with the following three government agencies who provide additional regulatory authority and/or education & technical assistance:

- The Clackamas County Soil and Water Conservation District
- ODA
- ODF

Most or all of the creek's recently collected DDT, dieldrin, TSS, and turbidity data has been shared with ODA's Natural Resources Division and with the Lower Willamette Agricultural Water Quality Local Advisory Committee. The Johnson Creek Watershed Council, the East Multnomah County Soil and Water Conservation District, and the Clackamas County Soil and Water Conservation District have incorporated, or soon will incorporate, this data into their outreach materials, including newsletters and web pages. The SWCDs will include the data in presentations at workshops that target commercial and “hobby” farmers. The data will be used to demonstrate that non-point source pollution is a significant problem in the Johnson

Creek watershed. Presentations will include a description of the Agricultural Water Quality Rules, the TMDL, the necessary source reductions for toxics from all non-point sources, and best management practices.

10. Mercury

10.1 Matrix of Management Strategies

Table 6 lists strategies for reduction and management of mercury.

10.2 Barriers to Implementation

Research has shown that much of the mercury which enters the Willamette River had been deposited in the watershed by the atmosphere. It is WES', Clackamas County's, CCSD #1's, and the City of Happy Valley's understanding that we are not legally responsible for preventing and/or controlling the portion of the River's mercury load that had been deposited on our service areas by the atmosphere. We will reduce mercury contributions to waterways to the extent possible where we have the authority to regulate stormwater discharges from the locations where mercury is deposited. In many instances, we will make "good faith" efforts to reduce the portion of the mercury load that is attributable to atmospheric sources.

The stated objective of the mercury TMDL is to reduce average fish tissue mercury concentrations in the Willamette River so that all fish species are safe for human consumption. The multiple fish consumption advisories for mercury in the Willamette Basin and the numerous 303(d) listings indicate that this beneficial use is not currently being met. DEQ acknowledges that it may take many years, perhaps even decades, to ultimately achieve the desired reduction in fish tissue concentrations of mercury. In establishing interim water quality guidance values, DEQ considered the criteria and thresholds utilized when fish consumption advisories are issued.

Given that Clackamas County's portion of the watershed possesses many land uses in large rural and urban areas, numerous agencies share jurisdiction over some of the activities which may cause in-stream mercury contamination. Other activities, such as those which cause the atmosphere to deposit mercury in the watershed, or certain ways to cause mercury-containing soil to be disturbed and eroded, such as through extensive off-road vehicle use on private property, are not regulated at all. Unfortunately, unregulated and thinly regulated sources of mercury appear to account for the vast majority of the River's annual mercury loading. Only a small amount of the River's annual mercury loading is being discharged by publicly owned wastewater treatment plants (estimated to be 2.72 percent of the Willamette River's total mercury load per year) or by industries (estimated to be 1.17 percent of the total/year).

Land ownership categories in Clackamas County that are potential sources of in-stream mercury loading via non-point source stormwater runoff which Clackamas County, CCSD #1, the City of Happy Valley and WES have very little or no authority to regulate or control include, but are not limited to:

- Privately owned timberlands
- Privately owned farm, ranch, nursery, and orchard lands
- U.S. government-owned lands
- Nearly all lands within cities, except Happy Valley
- Highways and other State-owned lands

For these reasons, Clackamas County, CCSD #1, the City of Happy Valley, and WES cannot and do not accept sole responsibility for reducing in-stream mercury loads from non-point sources in Clackamas County. Clackamas County, CCSD #1, the City of Happy Valley, and WES do accept some of the responsibility for reducing the fraction of the mercury loading:

- Which originates on those lands which Clackamas County, CCSD #1, the City of Happy Valley and WES have the authority to regulate, and
- Which is generated by the specific land uses that Clackamas County, CCSD #1, the City of Happy Valley and WES have the authority to regulate.

10.3 Implementation Monitoring, Annual Status Reports, and Evaluation Reports

Implementation monitoring will be conducted by Clackamas County's Departments of Transportation & Development, Business and Community Services, and/or Water Environment Services and the City of Happy Valley to confirm that specific Management Strategies that are outlined in this Implementation Plan were actually implemented. A summary of the work that was done to implement the Management Strategies will be submitted to DEQ in Annual Status Reports, as is required by the TMDL's "Water Quality Management Plan" (see page 11 of the WQMP). Every fifth year, an Evaluation Report will also need to be submitted. For more information on Evaluation Report requirements, also see page 11 of the WQMP.

10.4 Effectiveness Monitoring

Effectiveness monitoring is expected to be conducted to determine if our Management Strategies are effectively reducing in-stream mercury loading from sources that Clackamas County, WES, the City of Happy Valley, and/or CCSD #1 are completely or partially responsible for. At the present time in CCSD #1 UGB, WES performs a significant amount of monitoring of various pollutant levels under a DEQ-approved surface/stormwater monitoring plan: a) at several County-owned storm sewer outfalls during storms, and b) in several creeks in both dry weather and during storms. Due to the high cost of mercury analysis, mercury is not one of the pollutants that is monitored.

We plan to participate in a coordinated mercury monitoring project for discharges from the MS4 in the future. The findings will enhance our collective understanding of mercury transport and fate in stormwater. It is expected that useful information about mercury transport and fate in private storm sewer systems, in overland runoff, and in non-MS4 public storm sewer systems in our service areas, sources addressed by this Implementation Plan, can then be estimated after the project is complete. Before this mercury monitoring project can be initiated, Clackamas County, SWMACC and the City of Rivergrove will need to revise our surface/stormwater monitoring plan in response to the DEQ's Mercury Monitoring Order (MMO). The MMO was issued by DEQ on December 23, 2010. Phase I MS4 permit holders, including Clackamas County, SWMACC, and the City of Rivergrove, were included in the MMO. After this mercury concentration data is available, it will be used initially to establish a portion of the baseline level of mercury in our discharges. After a baseline is established, future mercury data will be compared to this baseline to determine if loading has been reduced by 27 percent or more (the TMDL's Interim Allocation Load).

Table 6. Management Strategies Matrix for Mercury

Source	Strategy	How and Implementer(s)	Fiscal analysis	Measure	Timeline	Milestone
<i>What sources of this pollutant are under your jurisdiction?</i>	<i>What is being done, or what will you do, to reduce and/or control pollution from this source?*</i>	<i>How will this be done and by which jurisdiction(s)?*</i>	<i>What is the expected resource need?*</i>	<i>How will we demonstrate successful implementation or completion of this strategy?*</i>	<i>When do you expect it to be completed?*</i>	<i>What goals do you expect to achieve, and by when, to know progress is being made?*</i>
1. Stormwater runoff	a. Develop Watershed Action Plans (WAPs)	WAP recommended updates and revisions to the existing stormwater design standards to emphasize low impact development techniques. These design standard revisions will be implemented by CCSD#1 in March of 2011. The emphasis on green infrastructure and infiltration mitigate stormwater runoff which may contain <i>E.coli</i> <i>Retrofit existing underperforming detention facilities to enhance water quality treatment. (WES, Clackamas County & Happy Valley)</i>	\$700,000 budgeted in FY 10-15.	Number of developments utilizing low-impact development standards and associated BMP contributing areas..	July 2010	<ul style="list-style-type: none"> By 2010, WAP developed. By 2011 implementation of WAP projects started. After 2011, progress will be evaluated for effectiveness and level of service.
	b. Stormwater regulations	Revise and implement design/construction standards for post-construction phase stormwater management of new/redevelopment. <i>(WES, Clackamas County & Happy Valley)</i>	Currently funded	Track permit applications for new/redevelopment and stormwater management measures implemented.	Ongoing. Revisions to design/construction standards will follow the development of Watershed Action Plans.	Evaluate measures annually for effectiveness and level of service; apply adaptive management.
	c. Industrial/ Commercial Stormwater Program	Implement the WES "Non-Single-Family Residential Maintenance Agreement Program" (NSFRMAP) The NSFRMAP agreements obligate property owners to clean and maintain their storm sewer system. <i>(WES)</i>	0.1 FTE required for NSFRMAP (budgeted for FY08)	Track annual letters sent to property owners in NSFRMAP identifying their requirements; track annual reports received from NSFRMAP property owners.	First annual letters sent by June 2009, ongoing work following	Annual letters sent beginning 2009; receive annual reports from owners. Evaluate measures annually for effectiveness and level of service; apply adaptive management.
	d. Water quality monitoring and other stormwater management activities	The DEQ's mercury monitoring order (MMO) was issued late December 2011.. In the future, in response to the MMO, it is expected that Clackamas County MS4 permit co-permittees, including but not limited to SWMACC, Rivergrove and CC, will begin monitoring for mercury in discharges from the MS4 as a part of the stormwater and in-stream water quality <i>(WES & Clackamas County)</i>	Existing monitoring levels currently funded. Additional funds required for mercury monitoring	Review monitoring results annually and evaluate effectiveness of management strategies.	Ongoing	Evaluate measures annually for effectiveness and level of service; apply adaptive management.

Table 6. Management Strategies Matrix for Mercury						
2. Illegal dumping of solid waste	a. Illegal dumping management and public education and involvement	Implement Clackamas County's Dump Stoppers Program and City of Happy Valley illegal dumping ordinance. Provide public education related to illegal dumping, including publicizing Metro hazardous waste facilities. <i>(Clackamas County & Happy Valley)</i>	Currently funded	<ul style="list-style-type: none"> Track waste removed through Dump Stoppers Program. Track # of persons/year who complete mediation process for solid waste dumping. Track # of enforcement actions taken/year for solid waste dumping. 	Ongoing	Evaluate measures annually for effectiveness and level of service; apply adaptive management.
3. Illicit discharges and spills	a. Spill response and IDDE	Implement spill response and IDDE program on Clackamas County full service roads and within CCSD#1's UGB subunit. Refer other cases to DEQ. <i>(WES & Clackamas County)</i>	Currently funded	Track the number of discharges/spills per year.	Ongoing	Evaluate measures annually for effectiveness and level of service; apply adaptive management.
4. Runoff and soil erosion from construction sites	a. Erosion control program and public and education and involvement	Implement erosion control programs in CCSD #1, SWMACC, Happy Valley, and Clackamas County DTD service areas. Require erosion control permits as applicable; provide technical assistance, education, and outreach as applicable. Implement road maintenance practices on Clackamas County full maintenance roads according to ODOT BMP manual for water quality and habitat. <i>(WES, Clackamas County & Happy Valley)</i>	Currently funded for CCSD #1, SMWACC, and Happy Valley; additional resources may be needed. Additional resources are needed in DTD service area.	Track erosion control permits issued; inspections performed; enforcement actions taken; and education and outreach activities implemented.	Ongoing	Evaluate measures annually for effectiveness and level of service; apply adaptive management.

* Note: Details on management strategies are provided in Chapter 7. Fiscal analysis primarily applies to Clackamas Co. and CCSD#1. City of Happy Valley management strategies may require further fiscal analysis.

10.5 Timeline

The goal of Clackamas County, WES, and Happy Valley is to attain the load allocations for each TMDL parameter through an adaptive management process. Clackamas County is committed to investing in activities and programs that contribute to overall watershed health. Clackamas County is currently implementing a variety of management strategies to improve and maintain water quality, as described in Chapter 7, and tracking the effectiveness of these activities with monitoring as described in Chapter 10.4. It is unknown at this time whether the current and planned level of management activities will provide enough pollutant load reduction to meet the load allocation given the barriers to implementation described in Chapter 10.2. As monitoring demonstrates progress toward pollutant reduction, Clackamas County will adaptively manage its activities and programs in order to work toward attaining the load allocations.

Quantifying Clackamas County's role in progressing towards meeting the entire Willamette River watershed's Interim Allocation Load (IAL) will be challenging due to the many potential sources of mercury and the barriers to implementation discussed above. The amount of mercury that is coming from Clackamas County stormwater runoff and other non-point sources has not yet been estimated closely. Only a small amount of the River's annual mercury loading is being discharged by publicly owned wastewater treatment plants (estimated to be 2.72 percent of the Willamette River's total mercury load per year) or by industries (estimated to be 1.17 percent of the total/year).

The attainment of the non-point source mercury IAL will likely be due to a loose or structured partnership with cities and private landowners, in combination with the following three government agencies who provide additional regulatory authority and/or education & technical assistance:

- The Clackamas County Soil and Water Conservation District
- ODA
- ODF

11. Temperature

11.1 Matrix of Management Strategies

Table 7 lists strategies for management and reduction of elevated water temperature.

11.2 Barriers to Implementation

Much of the privately owned land in Clackamas County's portion of the area regulated by the Willamette River temperature TMDL lies within timber management and agricultural areas. The TMDL for the privately owned lands in timber management and agricultural areas is being implemented through ODF and ODA. Management strategies for these lands are not contained within this Implementation Plan.

System Potential shade conditions likely cannot be attained within 100 percent of the watershed's riparian area in Clackamas County on Clackamas County, CCSD #1, and non-ODA/ODF privately owned lands due to private property rights, historic land use decisions, and other factors.

11.3 Implementation Monitoring, Annual Status Reports, and Evaluation Reports

Implementation monitoring will be conducted by the City of Happy Valley and by Clackamas County's Departments of Transportation and Development, Business and Community Services, and/or Water Environment Services to confirm that specific Management Strategies that are outlined in this Implementation Plan were actually implemented. A summary of the work that was done to implement the Management Strategies will be submitted to DEQ in Annual Status Reports, as is required by the TMDL's "Water Quality Management Plan" (see page #11 in chapter 14). Every fifth year, an Evaluation Report will also need to be submitted. For more information on Evaluation Report requirements, also see page #11 of the TMDL's Water Quality Management Plan.

Table 7. Management Strategies Matrix for Elevated Water Temperature

Source	Strategy	How and Implementer(s)	Fiscal analysis	Measure	Timeline	Milestone
<i>What sources of this pollutant are under your jurisdiction?</i>	<i>What is being done, or what will you do, to reduce and/or control pollution from this source?*</i>	<i>How will this be done and by which jurisdiction(s)?*</i>	<i>What is the expected resource need?*</i>	<i>How will we demonstrate successful implementation or completion of this strategy?*</i>	<i>When do you expect it to be completed?*</i>	<i>What goals do you expect to achieve, and by when, to know progress is being made?*</i>
1. Effective shade (radiant heat)	a. Implement Watershed Action Plans (WAPs)	WAP recommended high priority stream reaches for riparian restoration and uplift. Working through community groups and watershed councils CCSD#1 will implement riparian restoration and canopy cover enhancement in these high priority stream reaches. Retain Consultant and utilize TAC to develop WAPs for Kellogg-Mt. Scott; Rock; Cow-Sieben. WES WAPs to include but not be limited to: data gaps; human/built environment; current/future conditions; watershed functions and processes; watershed health attributes (hydrology, habitat, water quality, and biological communities); limiting factors; ranking criteria; prioritized stormwater management activities; watershed management goals; implementation roles, planning level cost estimates and schedule. <i>(WES, Clackamas County & Happy Valley)</i>	\$4,750,000 budgeted in FY 10-15-09.	Riparian restoration projects will be tracked using GIS in order to quantify the number of acres restored/enhanced annually.	July 2011-15	<ul style="list-style-type: none"> By 2010, WAPs developed. By 2011 implementation of WAP projects started. After 2011, progress will be evaluated for effectiveness and level of service.
	b. Riparian assessment and management	<p>i. Update biological surveys to include benthic macroinvertebrate surveys and habitat/riparian Inventories. Through IGA with ODFW, perform updated biological surveys for up to 18 river miles within CCSD #1 and up to 9 river miles within SWMACC (based in part on priority reaches and landowner access).</p> <p>Biological surveys to include:</p> <ol style="list-style-type: none"> fish abundance and distribution; habitat and riparian shade assessments; canopy density measurements; and continuous summer temperature monitoring during June thru Sept. <p><i>(WES)</i></p>	\$100,000 budgeted in FY 12-13. Additional resources required through FY 13-15 (see WAPs)	Final reports to include specific reaches with recommended list of actions for restoration and protection.	ODFW 2015 Macroinvertebrate surveys biennial	Identify and prioritize riparian areas. See WAPs

Table 7. Management Strategies Matrix for Elevated Water Temperature

		<p>ii. Ecosystem Surveys. NCPRD & County Parks will conduct habitat and riparian inventory data including canopy density measurements, riparian shade assessment and additional habitat variables.</p> <p>a) Biological survey data collected by WES and ODFW 2008 will be used as a preliminary assessment of data collection priorities and gaps.,</p> <p>b) Additional data collection will partially be completed through an Parks Ecosystem Assessment through Clackamas County Parks and NCPRD partially funded through the work performed by our Northwest Service Academy AmeriCorps member</p> <p>Survey data will be used to determine habitat conditions and result in management recommendations and priorities (e.g. enhancement of riparian buffers). Partnerships with other agencies, non-profits, citizen groups (e.g. Friends Groups), and volunteers will cooperate in review and prioritization process.</p> <p><i>(Clackamas County & WES)</i></p>	<p>Partially funded. Additional resources needed</p>	<p>Management recommendations and priorities will be used to guide planning and implementation efforts.</p> <p>Partnerships with other agencies, non-profits, citizen groups (e.g. Friends Groups), and volunteers will cooperate in planning review and implementation process.</p>	<p>July 2011</p>	<p>Complete Surveys</p> <p>Identify and prioritize riparian areas.</p>
		<p>iii. For roads with Full County Maintenance, apply ODOT Guide. As roads are maintained, repaired, and rebuilt, the ODOT Guide's BMPs will be used to address river/stream surface shade where appropriate over time.</p> <p><i>(Clackamas County & Happy Valley)</i></p>	<p>Currently funded. Additional resources needed</p>	<p>Qualitative assessment through interviews with staff.</p>	<p>Ongoing</p>	<p>Evaluate measures annually for effectiveness and level of service; apply adaptive management.</p>
		<p>iv. Integrated Pest Management Program (IPM) County Parks and NCPRD will use this plan for new projects and for maintenance of existing facilities.</p> <p><i>(Clackamas County & Happy Valley)</i></p>	<p>Currently Funded</p>	<p>Qualitative assessment through interviews with staff.</p>	<p>Ongoing</p>	<p>Evaluate measures annually for effectiveness and level of service; apply adaptive management.</p>
		<p>v. County Parks recently hired a part time employee who will concentrate on a tree planting program which will provide for upland and riparian improvement.</p> <p><i>(Clackamas County)</i></p>	<p>Currently funded.</p>	<p>Track the number of trees and plants planted annually in</p> <p>a) Riparian areas</p> <p>b) Upland areas</p>	<p>Ongoing</p>	<p>Evaluate measures annually for effectiveness and level of service; apply adaptive management.</p>
	e. Implement Other Watershed Protection Regulations	<p>i. Metro Title 3 - Within CCSD#1 & SWMACC. The equivalent of Title 3 is part of the SWM Rules and REGS for CCSD#1 & SWMACC. WES has contracted with Clackamas County Planning to administer these requirements within these two Districts and with the City of Happy Valley.</p> <p><i>(WES, Clackamas County & Happy Valley)</i></p>	<p>Currently funded. Additional resources may be needed</p>	<p>Track the number of approved Land Use Actions per year that are reviewed under the Natural Resource Protection sections of the CCSD#1 & SWMACC SWM Rules and Regs..</p>	<p>Ongoing</p>	<p>Evaluate measures annually for effectiveness and level of service; apply adaptive management.</p>
		<p>ii. Metro Title 3 – Outside of CCSD#1 & SWMACC but within UGB. Clackamas County Planning administers Title 3 in the areas of County jurisdiction where it applies.</p> <p><i>(Clackamas County)</i></p>	<p>Currently funded. Additional resources may be needed</p>	<p>Track the number of approved Land Use Actions per year that are reviewed under ZDO 709.</p>	<p>Ongoing</p>	<p>Evaluate measures annually for effectiveness and level of service; apply adaptive management.</p>
		<p>iii. Metro Title 13 (Goal 5)–Clackamas County/WES jurisdictional areas. This will be adopted by ordinance and HCA maps by DTD</p>	<p>Additional resources needed: (Minimum</p>	<p>Track the number of Land Use Actions that are reviewed under ZDO</p>	<p>Ordinance and Map of Habitat</p>	<p>Protection of Class I and II HCA's. Report to Metro</p>

Table 7. Management Strategies Matrix for Elevated Water Temperature

		Planning. (Clackamas County)	\$100,000).	706. Track the number and acreage of HCA's protected or mitigated.	Conservation Areas adopted by December 2008	REIN Program and annually.
		iv. Metro Title 3 & Title 13 (Goal 5)—City of Happy Valley jurisdictional area. This will be adopted by ordinance by the City of Happy Valley. (Happy Valley)	Additional resources needed: (Minimum \$25,000).	Track the number of Land Use Actions per year with wetland and riparian area setbacks. Track the number and acreage of HCA's protected or mitigated.	Ordinance and Map of Habitat Conservation Areas adopted by December 2008	Protection of Class I and II HCA's. Report to Metro REIN Program and annually.
		v. Willamette River Greenway (ZDO 705). This is administered by Clackamas County. (Clackamas County)	Currently funded	Track the number of Land Use Actions per year that are reviewed under ZDO 705.	Ongoing	Evaluate measures annually for effectiveness and level of service; apply adaptive management.
		vi. River and Stream Conservation Area (ZDO 704). This is administered by Clackamas County. (Clackamas County)	Currently funded	Track the number of approved Land Use Actions per year that are reviewed under ZDO 704.	Ongoing	Evaluate measures annually for effectiveness and level of service; apply adaptive management.
		vii. Floodplain Management District (ZDO 703). This is administered by Clackamas County. (Clackamas County)	Currently funded	Track the number of approved Land Use Actions per year that are reviewed under ZDO 703.	Ongoing	Evaluate measures annually for effectiveness and level of service; apply adaptive management.
		viii. ZDO 1002 and 709. Water Quality Resource Areas & Natural Resource Protection. These ZDOs are administered by Clackamas County. (Clackamas County)	Currently funded	Track the number of approved Land Use Actions per year that are reviewed under ZDO 1002 & 709.	Ongoing	Evaluate measures annually for effectiveness and level of service; apply adaptive management.
		ix. Protect riparian area with tree ordinance (City of Happy Valley only). This ordinance applies to all significant, existing trees in riparian areas. (Happy Valley)	Additional resources may be needed.	Qualitative assessment through interviews with staff.	Ongoing	Evaluate measures annually for effectiveness and level of service; apply adaptive management.
		x. Protect riparian area with potential new tree ordinance for urban areas of Clackamas County. Through initial efforts of citizen group (Urban Green), the County is currently reviewing other tree ordinances and conducting a tree canopy coverage survey. (Clackamas County)	Additional resources will be required.	Qualitative assessment through interviews with staff.	Ongoing.	Evaluate measures annually for effectiveness and level of service; apply adaptive management.
	g. Public involvement and education	i. Encourage landowners to voluntarily protect/enhance their riparian areas through public education and involvement (e.g. Earth Day event providing educational lecture, informational pamphlets, and field demonstration). (WES, Clackamas County & Happy Valley)	Currently funded, additional resources may be needed.	Qualitative assessment through interviews with staff.	Ongoing	Evaluate measures annually for effectiveness and level of service; apply adaptive management.
		ii. NCPRD partnership with Johnson Creek Watershed Council, SOLV, the Overland Neighborhood association and other	Currently funded	Qualitative assessment through interviews with staff.	First annual event 2008	Evaluate measures annually for effectiveness

Table 7. Management Strategies Matrix for Elevated Water Temperature						
		businesses and individual volunteers to work on a 5 mile section of Johnson Creek. Objectives are in-stream and riparian habitat, trash clean up and education on trash disposal, control non-native plants and education on native plant restoration, field education and implementation of buffer restoration. <i>(Clackamas County)</i>		Track the number of volunteer Events and their associated activities (i.e. amount of trash removed, Number of plantings, etc)		and level of service; apply adaptive management.
		iii. Provide education opportunities for Environmental Youth Corps members, school groups, private company and non-profit groups, and individual volunteers to help restore riparian habitats through restoration work events. These events highlight specific topics such as canopy cover, non-native plant invasion, soil erosion and health. <i>(Clackamas County)</i>	Currently funded	Track the number of volunteer Events and their associated activities (i.e. amount of trash removed, Number of plantings, etc)		Evaluate measures annually for effectiveness and level of service; apply adaptive management.

* Note: Details on management strategies are provided in Chapter 7. Fiscal analysis primarily applies to Clackamas Co. and CCSD#1. City of Happy Valley management strategies may require further fiscal analysis.

11.4 Effectiveness Monitoring

Effectiveness monitoring is conducted to determine if the selected management strategies are effectively reducing in-stream pollutant loading from sources that Clackamas County, WES, the City of Happy Valley, and/or CCSD #1 are responsible for. The resulting data will then, from time to time, be compared to:

- The non-point source temperature LA—or the LA surrogate, percent effective shade—to determine if the allocation or surrogate has been attained, and/or
- Current water quality standards and to historic data to determine if in-stream water quality has improved to the desired level or by the desired percentage.

In-stream temperature monitoring is expected to include:

- Continuous monitoring of water temperature in the Clackamas River (at Oregon City and at River Mill Dam near Estacada, and at Carter Bridge near Estacada) by the U.S. Geological Survey (USGS), in Johnson Creek (at Milwaukie, Portland, Gresham and on two tributaries) by the USGS, and in certain tributaries to the Clackamas River and to Kellogg Creek in CCSD #1 UGB by WES. Funds from CCSD #1 are paid to the USGS to offset a portion of the total cost of this USGS monitoring.
- Some grab sample monitoring in certain tributaries to the Clackamas River and to Kellogg Creek in CCSD #1 UGB by WES. Please see CCSD #1's MS4 permit's surface/stormwater monitoring plan for more information about current monitoring locations and frequencies.
- Some continuous temperature monitoring of the Willamette River near the City of Newberg in Yamhill County. This monitoring location is only about nine river miles upstream from the point where the River enters Clackamas County.
- Some monitoring of the Willamette River's temperature in the reach below the falls—the reach which contains the Kellogg and Tri-City Water Pollution Control Plant outfalls—although this monitoring is not required by their NPDES permits at this time, so this monitoring is not certain to occur.
- Some monitoring of the North Fork of Deep Creek's temperature upstream from the Boring sewage treatment facility's outfall.
- In the geographic area in Clackamas County that is regulated by the Willamette temperature TMDL, other temperature monitoring is expected to be conducted in the future by the DEQ, the Cities of Oregon City, West Linn, and possibly others, the U.S. Forest Service (USFS), Portland General Electric (PGE), and possibly others.

In addition, it is expected that riparian area shade monitoring will be conducted in the future in portions of Clackamas County through updated Biological Surveys and other programmatic efforts. Shade monitoring could be conducted by Clackamas County, CCSD #1, WES, the City of Happy Valley or other cities, DEQ, ODFW, the USFS, the BLM, and/or PGE.

11.5 Timeline

The goal of Clackamas County, WES, CCSD #1 and the City of Happy Valley is to attain the load allocations for each TMDL parameter through an adaptive management process. Clackamas County is committed to investing in activities and programs that contribute to overall watershed health. Clackamas County is

currently implementing a variety of management strategies to improve and maintain water quality, as described in Chapter 7, and tracking the effectiveness of these activities with monitoring as described in Chapter 11.4. It is unknown at this time whether the current and planned level of management activities will provide enough pollutant load reduction to meet the load allocation given the barriers to implementation described in Chapter 11.2. As monitoring demonstrates progress toward pollutant reduction, Clackamas County will adaptively manage its activities and programs in order to work toward attaining the load allocations.

Clackamas County will address the temperature TMDL by focusing on increasing riparian shading. It will take many years for sufficient numbers of new trees to be planted and many more decades for those trees to grow to full height to develop effective riparian shading where it is lacking. Even if every degraded riparian area in the portion of the watershed in Clackamas County were to be planted with native trees within ten years, which is exceedingly unlikely, it would take at least sixty more years for the trees in all of these areas to reach sufficient size to yield System Potential shade conditions.

As discussed in the Barriers section, System Potential shade conditions likely cannot be attained within 100 percent of the watershed's riparian area in Clackamas County on Clackamas County, CCSD #1, TCSD, City of Happy Valley, and non-ODA/ODF privately owned lands due to private property rights, historic land use decisions, and other factors.

It is expected that the eventual attainment of high system potential shade values in the Clackamas County portion of the Willamette temperature TMDL's watershed will be the product of a loose or structured partnership between Clackamas County, CCSD #1, the City of Happy Valley and:

- Citizens
- Non-profit organizations (watershed councils, Friends of Trees, SOLV, etc.)
- Certain for-profit companies who own land in the watershed
- The Clackamas County SWCD
- Metro (large landowner and riparian area regulator)
- Portland General Electric (PGE). They are the owner/operator of a hydroelectric generation system in the Clackamas River watershed. This system was determined by DEQ in Chapter 6 of the Willamette TMDL's to be adding a significant amount of in-stream heat to the Clackamas River. It is possible that PGE will provide mitigation for this impact by working with partners to install new shade by planting trees along creek and river banks in the Clackamas River watershed to reduce in-stream temperatures

12. Cold Water Refugia (CWR) in the Willamette River Mainstem

12.1 Matrix of Management Strategies

Table 8 lists strategies for management and enhancement of CWR in the Willamette River mainstem.

12.2 Barriers to Implementation

Clackamas County has limited jurisdiction and resources to address CWR in an Implementation Plan due to the following reasons:

- The Oregon Department of State Lands (DSL) and the U.S. Army Corps of Engineers regulate most types of in-river removal and fill activity—with the related 401 certification being administered by Oregon DEQ—and Clackamas County’s grading ordinance does not apply to any types of in-stream fill/removal, so any potential adverse impact to CWR from in-river removal and fill activity is not within Clackamas County’s control.
- The Oregon Department of Geology and Mineral Industries regulates in-river sand and gravel mining, so any potential adverse impact to CWR from in-river mining is not within Clackamas County’s control.
- DSL has sole authority to issue leases for various in-stream uses (floating docks, for example), so this type of potential adverse impact to CWR is not within Clackamas County’s control.
- Any cold water in the Willamette River which comprises a “Refuge” is above the River’s bed, and thus State-owned, and the water is also owned by the State. Clackamas County does not have ownership of the riverbed or of the water in the River. The State’s Water Resources Department grants rights to divert and use the River’s water, however.
- Oregon’s Department of Fish and Wildlife (ODFW) manages the Willamette River’s population of salmon and steelhead. These species use this 50 mile reach as a migration corridor. Given their experience with these populations and their technical expertise, it would be appropriate to ask ODFW in the TMDL to identify existing and potential future cold water refuges in the Lower Willamette River. Then Clackamas County or one or more of the County’s Service Districts could be asked by the State to protect or enhance any defined CWR areas in or near our service areas if it is within our power to do so.

Given that the CWR TMDL requirement only pertains to the Willamette River mainstem, it is our understanding that:

- This requirement pertains to Clackamas County in their capacity as a DMA.
- This requirement does not directly pertain to the City of Happy Valley, the edge of which is at least 5 (five) miles from the Willamette River.
- This requirement does not directly pertain to any portion of CCSD #1’s service area, for no portion of the service area is within ½ mile of the Willamette River.
- This requirement appears to indirectly pertain to the City of Happy Valley and the non-City portions of CCSD #1 UGB, for certain land use patterns in these areas could keep the water temperature of certain creeks low enough to provide a Cold Water Refuge at the confluence between the creek and the Willamette River. The Management Strategies that will be employed to eventually provide cooler creek flows are addressed in Chapter 7 of this Implementation Plan.
- While this requirement appears to pertain to discharges of treated wastewater from the TCSD and CCSD #1-Kellogg wastewater treatment plants, any requirement to do so will be addressed by DEQ in the future through the NPDES permitting process, and is therefore not addressed in this Implementation Plan.
- This requirement might pertain to Willamette River riparian area on CCSD #1 and TCSD-owned property near the two plants, but only if one or both of these facilities are adjacent to or near one or more Cold Water Refuges.

12.3 Implementation Monitoring, Annual Status Reports, and Evaluation Reports

Implementation monitoring will be conducted by Clackamas County's Departments of Transportation and Development, Business and Community Services, and/or Water Environment Services to confirm that specific Management Strategies that are outlined in this Implementation Plan were actually implemented. A summary of the work that was done to implement the Management Strategies will be submitted to DEQ in Annual Status Reports, as is required by the TMDL's "Water Quality Management Plan" (see page #11 in chapter 14). Every fifth year, an Evaluation Report will also need to be submitted. For more information on Evaluation Report requirements, also see page #11 of the TMDL's Water Quality Management Plan.

12.4 Effectiveness Monitoring

Effectiveness monitoring is conducted to determine if the selected management strategies are effectively reducing in-stream pollutant loading from sources that Clackamas County, WES, the City of Happy Valley, and/or CCSD #1 are responsible for.

Clackamas County plans to participate in a joint effort with other DMAs to identify existing CWR along the mainstem Willamette River and provide options for protecting or enhancing such areas. ACWA may play a role in managing this coordinated process. The joint effort to address CWR is expected to include completion of a report, most likely from a consultant, which identifies CWR and provides options for enhancement and protection of CWR, if appropriate. The report is also expected to recommend actions for effectiveness monitoring over time. The CWR management strategy will be evaluated annually for effectiveness and level of service. Adaptive management will be applied as appropriate to meet watershed health needs.

12.5 Timeline

The goal of Clackamas County is to attain the load allocations for each TMDL parameter through an adaptive management process. Clackamas County is committed to investing in activities and programs that contribute to overall watershed health. Clackamas County is currently implementing a variety of management strategies to improve and maintain water quality, as described in Chapter 7, and plans to track the effectiveness of these activities with monitoring as described in Chapter 12.4. It is unknown at this time whether the current and planned level of management activities will provide enough pollutant load reduction to meet the load allocation given the barriers to implementation described in other sections. As monitoring demonstrates progress toward pollutant reduction, Clackamas County will adaptively manage its activities and programs in order to work toward attaining the load allocations.

Table 8. PARAMETER: CWR

Source	Strategy	How and Implementer(s)	Fiscal analysis	Measure	Timeline	Milestone
<i>What sources of this pollutant are under your jurisdiction?</i>	<i>What is being done, or what will you do, to reduce and/or control pollution from this source?*</i>	<i>How will this be done and by which jurisdiction(s)?*</i>	<i>What is the expected resource need?*</i>	<i>How will we demonstrate successful implementation or completion of this strategy?*</i>	<i>When do you expect it to be completed?*</i>	<i>What goals do you expect to achieve, and by when, to know progress is being made?*</i>
1. Riparian area management	CWR assessment and management	Identify existing or degraded CWR and opportunities for enhancement and protection. CWR is expected to be identified in the future through a jointly funded, possibly coordinated effort by many DMAs, including other cities and counties. Options for enhancement of and protection for any CWR that would be identified are also expected to be developed. <i>(WES & Clackamas County)</i>	Additional budget will be required	Completed report, which identifies CWR and provides options for enhancement and protection of CWR, if appropriate.	June 30, 2013	Identify an individual or consultant who can take on the project and provide the deliverables identified under "Measure".

* Note: Details on management strategies are provided in Chapter 7. Fiscal analysis primarily applies to Clackamas Co. and CCSD#1. City of Happy Valley management strategies may require further fiscal analysis.

13. Review and Revision of Plan

According to OAR 340-042-0080(3)(a)(C), Clackamas County, the City of Happy Valley, and CCSD #1 shall “Provide for... periodic review and revision of the implementation plan.” We will review and revise the Implementation Plan on an as-needed basis. This Implementation Plan may be reviewed and, if we deem it necessary, revised at other times if we learn that one or more cost-effective modifications to the Implementation Plan can be made which, if implemented, will result in attainment, or significant progress towards attainment, of one or more LA.

14. Statewide Land Use Requirements

Oregon Administrative Rule 340-042-0080(3)(a)(D) states that—to the extent required by ORS 197.180 and OAR chapter 340, Division 18—evidence of this Implementation Plan’s compliance with the applicable land use requirements shall be provided. Clackamas County, the City of Happy Valley, and CCSD #1 are currently in compliance with all land use requirements which pertain to this Implementation Plan. This Implementation Plan is consistent with Clackamas County’s Comprehensive Plan and land use regulations, and with the City of Happy Valley’s Comprehensive Plan and land use regulations. These Comprehensive Plans have been acknowledged by Oregon’s Land Conservation and Development Commission to be in compliance with the Statewide Planning Goals. This Implementation Plan is consistent with the County’s Comprehensive Plan and the City’s Comprehensive Plan to the extent required by law.

For example, within the Clackamas County Comprehensive Plan’s “Natural Resources and Energy” Chapter, setback distances from streams/wetland/rivers are addressed with broad policies and in specific detail. These broad setback distance policies and details are then repeated and detailed further in Section 704 of the Zoning and Development Ordinance. While the Clackamas County Comprehensive Plan does not specifically mention TMDLs by name, overarching goals that are present in the TMDL—including the need to keep in-stream water temperatures down during the summer—are addressed in the Comprehensive Plan.

We have concluded that the City of Happy Valley’s and Clackamas County’s Comprehensive Plans have provisions that are relevant to this Implementation Plan and that this Implementation Plan is compatible with these provisions.

15. Citation of Legal Authority

- *Clackamas County Service District #1*. Organized under ORS 451 in 1974, CCSD #1 was empowered with surface/stormwater management authority by Clackamas County Board Order No. 93-196 on February 25, 1993. This Order authorizes CCSD #1 to provide nonstructural and structural non-point source pollution controls to meet state and federal regulations and to, in general, address surface/stormwater quality and flooding problems in the district. These controls are contained with the *Surface Water Management Rules & Regulations*, revised February 1, 2005, and in *the Surface Water Management Administrative Procedures*, dated January 2003.

The fees charged for services vary in CCSD #1’s four subunits: Hoodland, the North Clackamas Urban Area (includes the City of Happy Valley and a large, urbanized, unincorporated area), Boring, and Fischer’s Forest Park (FFP). Surface water management fees charged to customers in the North Clackamas Urban Area (CCSD #1 UGB) support a wide range of

Surface Water Management services for the community. The Hoodland subunit is in the Sandy River watershed and is not addressed by this Implementation Plan. The only surface/stormwater-related fees that are charged in the Boring and FFP subunits of CCSD #1 are for the review of plans and the issuance of permits for new/redevelopment—with corresponding controls that may include stormwater detention, erosion control, post-construction stormwater treatment, and wetland/streamside setback areas—so these are the only surface/stormwater-related services which are provided by CCSD #1 in Boring and FFP.

- *The Tri-City Service District.* This District was organized under ORS 451. Only one aspect of this district’s legal authority is relevant to this Implementation Plan: the right to manage the riparian area near the Clackamas River on the District’s property at 15941 South Agnes Avenue in Oregon City. At this time, the District has sufficient legal authority to so (i.e., remove weeds and plant new trees).
- *Clackamas County Comprehensive Plan, ZDOs, and Other Board Orders.* The Clackamas County Comprehensive Plan was last updated on May 31, 2000. The Comprehensive Plan addresses planning goals and policies, including land use, transportation, community and design plans, stormwater drainage, natural resources, and open space/parks. Current policies regarding development, implementation, and enforcement of stormwater controls for new development or redevelopment are identified in the Public Facilities and Services element of the Comprehensive Plan. The Comprehensive Plan provides authority to adopt measures that protect surface/stormwater quality.

Zoning and Development Ordinances (ZDO) provides the rules, regulations, and standards that implement the goals and policies of the Comprehensive Plan. The ZDOs that serve to protect surface/stormwater quality are:

- ◆ Floodplain Management District (Section 703)
- ◆ River and Stream Conservation Area (Section 704)
- ◆ Conservation Wetland District (Section 709)
- ◆ Willamette River Greenway (Section 705)
- ◆ Protection of Natural Features (Section 1002)
- ◆ Utility Lines and Facilities (Section 1006)
- ◆ Storm Drainage (Section 1008). Includes stormwater quality control, such as detention and erosion control.
- ◆ Open Space and Parks (Section 1011)
- ◆ Density Standards, Transfers and Bonuses (Section 1012)
- ◆ Planned Unit Developments (Section 1013)
- ◆ Open Space Review (Section 1103).

Regulations necessary to implement Metro’s Title 13 (mandated in part by State of Oregon Goal 5) are expected to be approved soon that will provide additional protection for riparian shade.

Existing regulations that prohibit illicit connections to storm sewers are promulgated in ORS 447.140. Clackamas County Board Order 81-1-36 (“An Ordinance Pertaining to Enforcement of the Building Code, Excavation and Grading Standards, and Sewage Disposal System Standards”), as amended pursuant to Ordinance No. 05-2000 provides Clackamas County with the authority to enforce regulations which prevent and control illicit connections. This Order was amended by Board Order 88-179 to include grading and filling regulations.

The Comprehensive Plan, ZDOs, and Board Orders apply during new/redevelopment and during times when development is not proposed or occurring. If a property is not being developed or redeveloped, Clackamas County’s Planning and/or Community Environment Divisions administer the applicable portions of the Comprehensive Plan, the applicable ZDOs, and many Board Orders. If a property has been proposed to be developed/redeveloped, all Plans are checked for conformance with the following:

- ◆ ZDOs (Clackamas County)
 - ◆ Grading and Excavation Ordinances (WES)
 - ◆ *The Roadway Standards Manual*. This document provides requirements for drainage standards, roadway standards, submittal requirements, including a section on hydrology, hydraulics, and water quality. The manual was completed in January 1999 (Clackamas County)
 - ◆ CCSD #1’s Rules and Regulations, but only if the property is in (or is requesting annexation into) CCSD #1. Developers may be required to provide stormwater detention, erosion control, post-construction stormwater treatment, and a streamside/wetland setback area (WES)
- *City of Happy Valley’s Comprehensive Plan and Codes*. The City of Happy Valley’s Comprehensive Plan’s last major update occurred in 1991. The Comprehensive Plan addresses planning goals and policies, including land use, transportation, community and design plans, stormwater drainage, natural resources, and open space/parks. Current policies regarding development, implementation, and enforcement of stormwater controls for new development or redevelopment are identified in the Public Facilities and Services element of the Comprehensive Plan. The Comprehensive Plan provides authority to adopt measures that protect surface/stormwater quality.

Title 16 of the City of Happy Valley Municipal Code (Development Code) provides the regulations that implement the goals and policies of the Comprehensive Plan. Particular Development Code sections that serve to protect surface/stormwater quality are:

- ◆ Subdivision/PUD design and improvement standards (Sections 16.16.110-16.16.120)
- ◆ Significant Natural Resource Lands (Sections 16.16.270-16.16.440)
- ◆ Water Quality and Flood Management (Sections 16.16.430-16.16.500)
- ◆ Tree Cutting and Preservation (Section 16.20.090)
- ◆ Surface Water Runoff and Detention (Section 16.20.170)

Regulations necessary to implement Metro’s Title 13 (mandated in part by State of Oregon Goal 5) are expected to be approved in 2008 that will provide additional protection for riparian shade.

Existing regulations that prohibit illicit connections – a toilet, for example – to storm sewers are promulgated in ORS 447.140. Clackamas County Board Order 81-1-36 (“An Ordinance Pertaining to Enforcement of the Building Code, Excavation and Grading Standards, and Sewage Disposal System Standards”) provide Clackamas County with the authority to enforce regulations which prevent and control illicit connections.

The Comprehensive Plan, codes, and City Council Orders apply during new/ redevelopment and during times when development is not proposed or occurring. If a property is not being developed or redeveloped, the City’s Community Services Department administers the applicable portions of the City’s Municipal Code. If a property has been proposed to be developed/redeveloped, all Plans are checked for conformance with the following:

- ◆ Conditions of Approval associated with the pertinent land use approval
- ◆ Provisions of the Development Code
- ◆ The Engineering Design Standards Manual
- ◆ CCSD #1’s Rules and Regulations, but only if the property is in (or is requesting annexation into) CCSD #1. Developers may be required to provide stormwater detention, erosion control, post-construction stormwater treatment, and a streamside/wetland setback area.

16. References

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